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AGRICULTURAL EXPERIMENT STATION

**The Progress of Research
In Serving Agriculture**

**SIXTY-SIXTH ANNUAL REPORT
1952-1953**

**BULLETIN A-78
COLLEGE PARK, MD.
JANUARY, 1954**

In addition to State and federal funds, the research program of the University of Maryland Agricultural Experiment Station has received support during the year from many public, private and industrial organizations and individuals. It is regretted that space does not permit recognition of all sources of help, but the cooperation of all is herewith gratefully acknowledged.

Visitors will be welcome at all times, and will be given every opportunity to inspect the work of the Agricultural Experiment Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge to all residents of the State who request them.

Address:

AGRICULTURAL EXPERIMENT STATION

Colleg Park, Maryland

I. C. Haut, *Director*

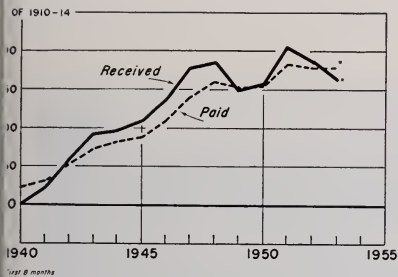
**To the Governor of Maryland, the Board of Regents, and the
President of the University of Maryland**

I transmit herewith the Sixty-sixth Annual Report of the University of Maryland Agricultural Experiment Station, as established by Act of Congress, March 2, 1887, containing an account of research and experiments conducted during the fiscal year ending June 30, 1953, and a statement of the receipts and disbursements for the same period.

**I. C. Haut,
Director**

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This Chart Shows how the prices farmers received compared to those they paid from 1940 to 1953.

The objective in Agricultural Economics and Marketing research is the application of economics to the farm business and to farm family living. Research on this phase of agriculture during 1952-53 included studies in poultry and dairy marketing, farm credit, marketing of canned fruits and vegetables, farm prices, rural zoning, rural transportation, farm management, rural taxation and farm insurance.

Data being Collected to Measure Cost-Price Squeeze

Maryland farmers have been caught in a terrific cost-price squeeze as a result of falling prices and rigid costs. This trend began prior to the Korean War, which arrested it temporarily, but it has become acute in recent months as the accompanying chart for the United States indicates.

A study is underway to develop background data on prices paid by Maryland farmers for supplies purchased to accompany that on prices received by Maryland farmers for products sold, thereby showing the

specific cost-price relationship for Maryland. (Project A-26-1)

Rural School Bus Problems Studied in Several Counties

Continued trends toward consolidation, larger urban schools, and location of schools outside of urban areas have added to the public school bus transportation requirements, and in some instances resulted in excessive mileage traveled by buses in comparison with the percentage of public highway mileage used.

Most schools use one of three general systems of school bus transportation depending upon the location of the school plants. One system of transportation collects elementary and high school pupils simultaneously for the same school center. In another system the elementary pupils and high school pupils are transported to separate locations, sometimes on separate trips. A third school bus system prevails in those counties where the elementary, junior high and senior high school plants are located at different centers, and, in general, the elementary schools serve as the

Agricultural Economics and Marketing



From 50 to 98 per cent of the pupils in rural Maryland high schools ride school buses. These pupils will be off the school grounds within six minutes after classes are dismissed.

concentration point for the high school pupils, with the junior high schools serving as relay points for pupils going to senior high schools.

In four counties studied in detail, one-third of the elementary pupils boarded the buses before 8:00 a.m. and a considerable proportion of both elementary and high school pupils arrived at school by 8:00 a.m.

School bus routes are characterized by considerable back-tracking and over-lapping of routes. Results from the study show that about one-third of the bus mileage traveled is actually on the road segments along which pupils live or assemble; another one-third of the mileage is mileage without pupils and the other one-third is back-tracking and loaded bus mileage.

School bus transportation is a vital part of the school program, especially of consolidated schools. Larger school units result in more

pupils being transported and longer bus routes in most instances. Therefore, in locating future school plants the advantages of an optimum sized school must be balanced against the disadvantages of long school bus routes in most rural areas. (*Project A-19-0*)

Various Phases of Rural Fire Problems Studied

Rural volunteer fire companies receive relatively little tax support, but have large responsibilities. Since World War II most of these fire departments have improved their plant facilities and fire fighting equipment. The recent trend is to add kitchen and dining room facilities to fire houses and many of the departments have larger plants which serve various community needs.

Important fire prevention measures on farms in north-central Maryland are fire-proof roofs, proper chimney construction, and prop-

erly installed lightning rods. A survey of farms in that area shows that substantial improvements can yet be made on farms with respect to taking fire prevention measures.

The principal fire protection measures are improved farm lanes, an adequate water supply and a telephone. The survey also shows that more than one-third of the farmers could reduce fire hazards by adding these protection facilities.

Farm fire insurance rates are about 5 per cent less for farm buildings located within a travelable four miles of an approved fire department. An analysis of the fire protection and prevention measures on farms in north-central Maryland, divided into those farms within four miles and those from four to six miles from a fire house, suggests that the differences in the frequency of fires and fire protection

and prevention measures in the two zones may not justify the fire insurance rate differential. (*Project A-19-n*)

Studies Show Farmers' Tax Obligations Have Expanded in Recent Years

Shifts in the emphasis on state taxing measures have held farm real estate taxes down, but have increased farmers' tax liabilities in other forms.

Farmers' real estate taxes per acre increased from \$.73 to \$1.02 between 1940 and 1951. The per capita property tax liability throughout the counties is higher for the farm population than for non-farmers. In some counties it is two to three times as much for the farming population.

Highway user taxes paid by farmers about doubled in the last 12 years. In 1940 there was no state sales tax but in 1951-52 farmers



A survey of farms in North-Central Maryland showed that lightning caused 20 per cent of barn fires.

paid about \$1,900,000 in state sales taxes.

Evidence points to a fair balance of the major taxes in Maryland between farmers and non-farmer groups, so far as the first impact or liability is concerned. Farmers' tax liability in Maryland on account of property taxes, highway-user taxes and sales taxes was about \$1.10 per capita greater than it was for non-farmers in 1951-52.

Data developed in this study show the need for current, or at least frequent, study of farm tax burdens as a basis for promoting continuous equality in tax liabilities between farmers and other groups. (*Project A-19-k*)

Types-of-Farming Areas Undergo Constant Change

Types-of-farming in Maryland were not planned; they developed out of the basic physical climate, and the diversity of needs as the State became more and more urban. Through the years farmers have tried many combinations of enterprises in an attempt to use their land resources most effectively and to supply market demands. From this accumulated knowledge and experience, the majority of farmers became convinced that a particular type of farming best fits the conditions and needs in an area.

There are twelve types-of-farming areas in Maryland. The tobacco production area is the most distinct, but considerable changes in farm enterprises have been taking place in this area in recent years.

A rapid shift to broiler production on the Lower Eastern Shore during the last two decades has resulted in less emphasis on vegetable crop production with more emphasis on grains and soybeans. Dairy farming is the predominating type in the area adjacent to the larger cities, and the tendency is toward larger dairy farms.

These changes in Maryland agriculture and shifts in types-of-farming indicate the need for continuous farm management research as a basis for extension education toward efficient and economical agricultural production. (*Project A-18-ae*)

Farm Drainage Problems Apply to Many Eastern Shore Farms

The installation of drainage on Eastern Shore farms was accompanied by a number of beneficial results. Plowing, planting, cultivating and harvesting could be done from 7 to 14 days earlier after installation of a drainage system. Drainage was also accompanied by increased crop yield, but a complete system of drainage had to be installed in order to obtain maximum yields. In some instances the installation of drainage resulted in increased efficiency of farm layouts by making possible the shifting of fences to make fields larger. But benefits of drainage are not being fully utilized, particularly on group drainage enterprises. A large number of farms included in Public Drainage Associations did not have the necessary field drains in-

stalled, materially decreasing the effectiveness of drainage on those farms. All too frequently the outlets of Public Drainage Associations are permitted to silt up, cutting down the effectiveness of the original improvements.

Complete drainage installations on individual farms or groups of farms, adequate maintenance of the drainage facilities are needed if all potential benefits are to be derived from such facilities.

(Project A-32-h)

Retailers Benefit from Poultry Merchandising Schools, According to a Before and After Study

Of 204 retailers surveyed just prior to and about three months after poultry merchandizing courses were held, it was found that 53 stores sent trainees to the schools. Of the number that attended only 26 retailers made changes in their handling practices. These stores were a cross section of chain and independent stores in the two cities included in the study.

Retailers who attended the course and made changes in their practices (26 stores) increased their volume of poultry sales over the group that did not attend and did not make changes (129 stores). Chicken sales increased by an average of 73.1 pounds, turkey 25.0 pounds and eggs 11.8 dozens per store in one week for the group that attended the course and made changes. In stores where there were no trainees and no changes were made chicken



This new technique for cutting up poultry was one of the practices checked.

sales increased on 6.4 pounds, turkey decreased 5.0 pounds and eggs increased 9.5 dozens per store in one week. The dollar volume of sales of poultry products increased an average of \$55.48 per store (one week) for stores that had trainees and made changes. By comparison the volume increase was only \$2.33 per store for those which had no trainees and made no changes.

Retailers who attended the course and made changes in their practices experienced a greater increase in volume than those who attended but made no changes. The group that attended and made changes increased their volume per store for one week by: Chicken 73.1 pounds; turkey 25.0 pounds; and eggs 11.8 dozens. The group that attended but made no changes increased chicken sales by 1.2 pounds and egg sales by 1.8 dozens

during the same week, but their turkey sales dropped 7.5 pounds. Here again the net change in dollar volume per store tells the story. The group of 26 stores whose personnel attended and made changes had an increase of \$55.48 per store (one week) compared to a decrease of \$22.13 in store volume by the group that made no changes. This amounts to a net difference of \$77.61 in store volume between the two groups and shows the effect the training course had.

More than one-half of the stores with trainees that made changes averaged only one change per store. Others made two and three changes per store but no store made more than five changes. Practices that were changed by the most stores were the method of cutting chicken and the frequency in the delivery of poultry products to the store. Other changes included the use of a cost chart, the refrigeration of egg displays and the use of better arrangement of poultry while on display.

The quality of poultry offered to consumers was greatly improved due to a more frequent delivery of poultry commodities to the retailer, better methods of cutting and display of poultry meat and better retailer practices all around. Thirty-one retailers said that the off condition of their poultry had decreased or in other words that the quality had improved as a result of the training course. (*Project A-26-ah*)

Price-Quality Relationship of Maryland Canned Vegetables Comparable With that of Similar Items from Major Competing Areas

A recent survey of 37 food brokers in 18 cities in 8 states and of 37 wholesale grocers in 36 cities in 16 states indicates general trade acceptance of Maryland canned vegetables. Fifty-one per cent of all brokers said that Tri-State (Maryland, Delaware and New Jersey) canned vegetables sell at prices comparable to similar items from other major supply areas and 43 per cent said prices were lower. In terms of quality, Tri-State canned vegetables compare favorably with those of competing areas. Fifty-four per cent of the brokers contacted rated Tri-State items as good or better than similar items from competing areas.

Comments of the "trade" indicated that Tri-State canners should advertise more extensively, improve quality, maintain uniform quality, and meet freight rate competition to competitive markets. (*Project A-26-ab*)

Tests Show Cold-Wall Tanks Saving Labor and Milk for Maryland Dairy Farmers

A survey of 59 fluid milk producers supplying the Washington market who had cold-wall tanks by August 1, 1952, shows that this new type of equipment is effectively saving labor and milk. Laborers on these dairy farms were universally in favor of cold-wall tanks over the old system of shipping milk in 10 gallon cans and so far no difficulties of any conse-

quence had been experienced with off odors or flavors.

Almost 90 per cent of the producers had 300 or 400 gallon tanks. There was considerable range in the capacity of these tanks in relation to the volume of milk produced daily, however. During the flush month for each producer in 1952 the 400 gallon tanks were filled to 55 per cent of capacity on the average and the 300 gallon tanks were filled to 57 per cent of capacity. Thus, on the average, these tanks would hold three milkings but not four milkings in the flush month.

The only apparent disadvantage to this new system of handling milk on the farm is the initial investment of \$2,500 to \$3,500 per farm, but it is likely that difficulties associated with steadily declining volume on can routes, the use of cold-wall tanks by small producers, and the inefficiency of operating both can and

tank receiving systems at the plant will develop in the future. (Project A-26-ae)

Study of Broiler Records Shows Trend Toward Greater Production Efficiency

Broiler records obtained in the Delmarva area for the years 1947 through 1952 show that producers are now growing a heavier bird in less time and with less feed than was possible six years ago. In 1947 it took 13 weeks to grow a 3 pound broiler while in 1952 it took only 11 weeks to grow a 3.2 pound bird. Producers have found that a shorter growing period due mainly to a greater feed efficiency has resulted in a lower cost of production. The cost of feed, labor and overhead are the principal items which have been reduced.

The study shows that it takes about 2 pounds less feed today to grow a 3 pound bird than it did six years ago. In 1947, 4.1 pounds of feed were

AVERAGE WT. OF BIRD AT 11 WKS (LBS.)	YEAR	AVERAGE LB. FEED PER LB. OF GAIN
2.6	1947	4.1
2.5	1948	4.0
2.7	1949	3.9
2.8	1950	3.7
2.9	1951	3.4
3.2	1952	3.4

Delmarva broiler growers are producing a heavier bird at the end of 11 weeks than they were six years ago. The amount of feed needed per pound dropped over the same period of time.

required per pound of broiler sold, while by 1952 only 3.4 pounds were required. The saving in feed alone has resulted in a saving of \$100 per 1,000 birds started. This saving is due to better feeds, improved breeding and better management practices. As a result of these and other improvements in the efficiency of production Maryland broiler producers remain in a favorable position for meeting competition given by other areas. (*Project A-26-ad*)

Low Bid Rejections Pay Maryland Tobacco Growers

In a study of the marketing of Maryland tobacco 349 baskets were followed to their ultimate buyer after farmers had rejected the bids from the first sale. Slightly more than 80 per cent of these baskets were sold at a higher price than the rejected bid. Twelve per cent were sold at the same price and 7½ per cent were sold at a lower price. Thus, Maryland farmers increased their returns for tobacco by rejecting bids on baskets which appeared to be worth a higher price. The net increase in value per basket for the entire 349 was \$12.

This study also indicated that Federal graders were unable to consistently place the same grade on baskets of tobacco on subsequent inspections. However, the new grade rarely differed substantially from previous grades in average price per pound on the market. (*Project A-26-ag*)

Other research studies in Agricultural Economics and Marketing include: *Marketing Maryland Forest Products, Farm Tenancy and Leasing Arrangements in Maryland, Reducing Costs, Determining and Maintaining Quality, Increasing Efficiency in Marketing Maryland Poultry Products, Rural Cooperative Credit, An Appraisal of the Economic Efficiency of Marketing Apples in the Shenandoah Valley Area, Agricultural Production Capacity and Efficiency, A Study of Retail Practices and Egg Quality in Baltimore, Rural Zoning in Maryland, Factors Affecting the Cost of Insurance to Farmers, and Maryland Tax Assessment Practices Concerning Various Classes of Poultry.*

• Agricultural • Education

Research Explores Possibilities of Systematic Education for Young and Adult Farmers

Only a limited number of Vocational Agricultural Education Adult Classes have operated in Maryland to date, except in connection with the special programs in Rural War Production and Veterans' Institutional-On-Farm Training. Many county school administrators and high school principals said they favor starting more adult classes in the regular Vocational Agriculture program as the Veterans' Program is terminated. More than 90 per cent of the teachers of Vocational Agriculture felt such classes would enhance the standing of Vocational Agriculture in their community and half of them expressed a high interest in starting them (another 42 per cent expressed mild interest).

Approximately 200 farmers, about equally divided between Clarksville community in Howard County and the Southern High School area in Anne Arundel County, were interviewed concerning their interest in such classes. More than 70 per cent in each community indicated they would be interested in attending adult classes if they were organized. Both groups of farmers expressed considerable interest in machinery, crop, pasture and livestock problems; farmers in the Clarksville community also expressed high interest in building problems.

The interest expressed by school personnel and farmers in Adult Agricultural Classes should insure their success if they are started. Undoubtedly Vocational Agriculture teachers should be encouraged to develop this phase of their program.



The tobacco spearing machine in field operation. The man in front steers and feeds plants into the machine. The second man removes full sticks and places empty sticks in the machine.

Agricultural Engineering

Self Propelled Tobacco Spearing Machine Tested in Field

The 1952-53 season marked the first field tests of the tobacco spearing machine operating as a self-propelled unit. Two men operated the unit in the field and very satisfactory results were obtained. The field tests were on a limited scale, due to abnormal seasonal conditions which made the tobacco plants brittle and caused the stalks to split out at the butt end. The machine is being rebuilt, making provision for adjustment to overcome this fault; other mechanical corrections designed to improve the operation of the machine will also be made. (*Project R-11*)

Tobacco Curing With Forced Air and Supplemental Heat Tested

Tests were continued during the season on the use of supplemental heat and forced air to control curing of tobacco during high humidity weather. This was the first season that two curing laboratories of equal size were available, making comparative results possible. The two units were filled with tobacco at the same time. The check barn was managed as a farmer would normally do with no heat being used. The test barn, a cinder block unit, was equipped with a 10,000 C.F.M. (cubic feet per minute) fan to force natural outside air through the tobacco and with an oil burner and a 3,000 C.F.M. fan to

force heated air through the tobacco. This heated air could be recirculated through the heater, giving more efficient use of the heat. Very good control of curing conditions was obtained in the test unit. The crop has not been graded to date.

Tests were also carried out in a full sized Southern Maryland tobacco barn using wickless oil burners uniformly spaced on the floor of the barn. No flues were required as the gases were released in the barn. Very satisfactory results were obtained, with good distribution of heat throughout the barn and no damage to the tobacco was observed due to the presence of the gases in the barn.

The temperature was not allowed to rise above 100°F., and indications from the test show that if the temperature is kept below this point, very good curing can be obtained without "haying down" of the tobacco.

The maximum heat capacity of the different units tested varied between 21,000 and 30,000 BTU's per 1000 tobacco plants. Preliminary research indicates that this is sufficient capacity,

but with barns of loose construction due to numerous cracks and openings, this should be increased. When supplemental heat is to be used, every effort should be made to close all cracks and openings in the barn to conserve heat. (*Project R-11*)

Use of Heated Air for Hay Drying Studied

The survey of mow curing systems in Maryland was continued so that the various heat units in use could be studied. It was found that most of the heated air hay dryers were used to dry baled hay. The use of heat speeds up the drying process from 20 to 50 percent, depending on initial moisture content, type of hay, and amount of heat used. However, heat also speeds the rate of mold growth so that a minimum of 30 C.F.M. (cubic feet per minute) of air per square foot of floor area is recommended instead of the 25 C.F.M. per square foot normally used in the design of natural air dryers for baled hay.

Many commercial "crop dryers" on the market supply heated air for a drying system. In all cases, the ef-



Problems of curing, handling and storage of tobacco are studied in these agricultural engineering experimental laboratories.



Agricultural engineers discuss a heated air hay drier with a Maryland farmer. Bales are placed cut side down, alternated in direction and packed tight.

fective air delivery of the fan used is reduced from 20 to 30 per cent due to partial blocking of the air passage with the heat exchange equipment. To produce high quality hay this air reduction must be compensated by reducing the size of dryer area on which the hay is placed so that the minimum of 30 C.F.M. per square foot is obtained.

When the hay is dried faster with heat, a higher quality hay is generally made, due to a much higher percentage of *digestible* nutrients. A farmer should produce at least 100 tons of dry hay each season to justify the additional expenses required to dry with heat.

Dividing the state into three sections, the following recommendations should be used as a guide in deciding whether or not to use heat.

Western Maryland

Heat is *not* necessary to dry long or chopped hay. Heat is not necessary

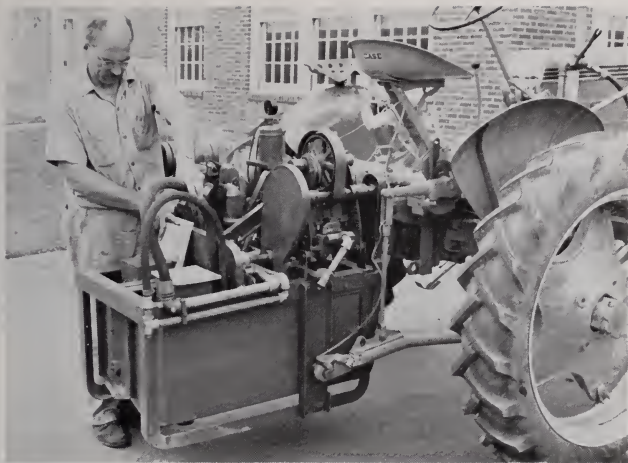
to dry baled hay when less than 125 tons are produced. When using baled hay, heat has an advantage for larger producers and will in all cases give a higher quality hay in a properly designed and managed system.

Central Maryland

Heat is not necessary to dry long or chopped hay or baled hay when less than 100 tons are produced. Heat is slightly more effective in this area than in Western Maryland. Baled hay is best dried on a batch type dryer in which case 10 to 20 tons are dried at a time and then moved to storage.

Eastern Shore

Producers of 100 tons or less need not use heat but cannot produce as high quality hay without heat as the preceding areas. For baled hay a batch type dryer, with heat, should be used. Longer drying periods are usually required in this area. Therefore, heat is most advantageous in



This dual-tank high pressure spray unit is used for research work. A single 50-gallon tank would be used for regular farm operations.

producing a quality hay. (*Project R-14*)

Ear Corn Drying With Unheated Air

Due to favorable drying weather, extremely high moisture corn could not be found for the 1952 tests. Bins and cribs were filled with corn at an average grain moisture content of 25.6 per cent which is usually considered the upper safe limit for crib storage. No spoilage or mold was found in any of the bins or the crib at this moisture content. As much drying was done in 14 days by forced ventilation at 4 C.F.M. (cubic feet per minute) of air per cubic foot of space as was done in 31 days in the crib without forced air circulation. Four C.F.M.

of air per cubic foot of space, as in 1950 and 1951, provided appreciably faster drying than 2 C.F.M. but there was little advantage in going to 6 C.F.M. The higher air rates, of course, require larger blowers, higher pressures and more power.

Intermittent blower operation controlled by humidistat again provided faster drying than continuous operation with a saving of about one-half in the electricity used. (*Project R-12*)

Labor Saving Devices For Tomato Harvest Look Promising

Tomato growers in Maryland have had a discouraging labor problem for the past several years. Lack of available labor has caused growers to

reduce the acreage of tomatoes or to harvest only part of their crop. Both result in loss of income for the grower.

In 1952 a belt conveyor mounted on wheels was built to help make better use of labor available to tomato growers. This conveyor straddled five rows and was operated by five or six laborers. Pickers walked behind the conveyor picking the crop and placing the tomatoes on the belt. The tomatoes dropped into baskets carried on the end and were removed and placed on the ground. By pivoting the machine at the ends of the rows, the direction of travel is reversed and the baskets are placed on the ground for truck pick-up at 10-row intervals.

The use of the conveyor eliminated basket carrying completely ex-

cept for pick-up. Checks on timing, with inexperienced help, showed an increase in picking capacity of 30 per cent for five pickers working the conveyor. Checks made were relatively few due to the poor tomato crop.

Work was done on the conveyor largely to find the value of proceeding with such a unit. Farmers and canners who saw or used the conveyor felt that development work should continue. In the 1953 season, a self propelled model will be constructed with mechanical changes necessary to improve its economy and practicability. It is also necessary to try the conveyor in areas other than the Eastern Shore before complete recommendations can be made. (*Project R-15*)

Agronomy



These plots of soybeans are typical of those used in all field crops research.

Progress in field crops and soils research is gradual. The findings that look promising in any one year must be tested many times so that when they become recommendations the conditions under which the findings will add to better and more profitable agriculture are clearly understood. The research reported here shows both information that has been thoroughly tested and indications that are coming from current research, and which must be tested further.

The search for fundamental and applied information leads to many studies. Some lay the background for future research, while others have immediate practical value. In this work the Agronomy research staff is cooperating with other departments of the Maryland Agricultural Experiment Station and giving close attention to the findings in other states.

Grain Crops

Soybean Testing Program Enlarged

During the past 10 years soybeans have become a crop of major importance in Maryland. Recent reports indicate that approximately 100,000 acres are now devoted to this crop. From the larger part of this acreage, the soybeans are being grown for seed. A survey of the principal areas in which these soybeans are being grown showed that many farmers were not satisfied with the varieties in use, and that many of the varieties were badly mixed.

For the past several years soybean variety tests have been restricted to those conducted at the Plant Research Farm. During the past year it was possible, through a cooperative agreement with the Bureau of Plant Industry, U. S. Department of Agriculture, to conduct two replicated variety tests in the principal soybean

growing areas of the Eastern Shore.

One of these tests, located on a sandy soil, included 27 experimental selections, along with the accepted varieties. The other, located on a heavier soil, included 17 experimental selections and the standard varieties. As a result of these tests, previous experience at the Plant Research Farm, and information from adjoining states, a list of recommended varieties has been prepared for farm use. This list has been widely distributed and is as follows:

Short season—Lincoln, Adams

Medium season—Perry, Wabash, Chief, Patoka

Long season—Dorman, Dortch-
soy 67, S-100, Luthy

(Project B-43)

Field Corn Hybrids Continue to Perform Well in Tests

Corn is the most important feed-grain crop in Maryland. Agronomists at the University of Maryland Agricultural Experiment Station conduct tests throughout the State to provide the information necessary to keep Maryland abreast of the continuing improvements in corn hybrids now being recommended. The margin of improvement may be represented by higher yield, more consistent yield from year to year, more disease resistance, better standability, or types more suitable to prevailing cultural practices. Continuing field comparisons from year to year at different locations in the State are necessary for reliable evaluation of new hybrids. In 1953 several new hybrids, Conn. 870 (medium season), Pa. 602 (early), Ohio W64 (early), and U. S.

578 (late), added another year to their good performance in preceding years. (Project B-50)

Sweet Corn Hybrids Tested

Sweet corn processing is an important enterprise in several areas of Maryland. This industry is highly competitive, which means that Maryland producers must always strive for high efficiency. The use of the most productive hybrids of good quality is an important step toward such efficiency.

Research in this line has been the means of evaluating new hybrids for the State. Its results have also demonstrated varietal requirements for this area to out-of-state seed breeders and producers. In 1952, fifty-two sweet corn hybrids were compared in a field test at College Park and the results were reported in Misc. Pub. 156.

In addition, 25 experimental hybrids were compared in observation rows. A nursery of about 100 inbred lines, of which 80 have been isolated from crosses with Maryland sweet corn, was observed. From among these lines promising material was selected for future use. (Project B-44)

Varieties of Small Grains Being Compared

Wheat: Comparative performance records were obtained in six regional field tests for the most important and promising wheat varieties for the Middle Atlantic area. The old varieties Thorne, Leapland, and Nitany continued to perform satisfactorily, but an experimental selection,

USDA 2381, has a slight yield advantage over a 5-year period. This variety has been more consistent in yield and has shown its principal advantage in years when leaf rust was damaging. This selection came from a cross between the Maryland variety Leapland and a South American variety called Fronteira. It is being increased for naming and release.

This year a new phase of wheat testing was begun in which four levels of fertility were used to study the comparative performance of the varieties Thorne, Leapland, Nittany, Vigo, and USDA 2381. These tests were begun because of problems encountered when wheat is grown under higher levels of fertility than are found on the average in the State. There is a tendency for some of these varieties to lodge, particularly when the nitrogen level is high. No significant difference was found in this first year of the test among the responses of the varieties to different

fertility levels. (*Project B-39*)

Barley: Wong, the most widely grown variety in the State, has been evaluated in tests and found to be the best for use in Maryland. New research will test the latest selections for productivity in comparison with the Wong variety. This work in barley has led to a large increase in acreage in the State, but there is need for further variety development to maintain this acreage at a high level of production. (*Project B-41*)

Rye: A new variety of rye from Germany, known as Laube's cover crop rye, was compared with the widely used variety Abruzzi, both at College Park and at Salisbury. In this first year of comparison the results obtained were as follows:

Variety	Bu. Grain	p/A	Tons	Straw	p/A
Laube's	25.3			2.6	
Abruzzi	14.4			4.0	

This indicates a need for further testing of this variety to determine its place in Maryland. (*Project B-57*)

Pasture and Hay Crops

Information Gained on

Beef Production from

Various Pasture Mixtures

An important part of the search for better pasture and forage crops is the study to determine the pounds of beef per acre that can be obtained from various pasture mixtures. This year a study begun in the late summer of 1949 was concluded. Five pasture mixtures were compared: (1) Orchard grass and Ladino clover,

(2) tall fescue and Ladino clover, (3) Kentucky bluegrass, white clover, and timothy, (4) orchard grass and Korean lespedeza, and (5) tall fescue and Korean lespedeza. These were established on land not well suited to the growth of tobacco, and which had been relatively unproductive, at the University of Maryland Tobacco Experimental Farm near Upper Marlboro.

Each year during the test yearling

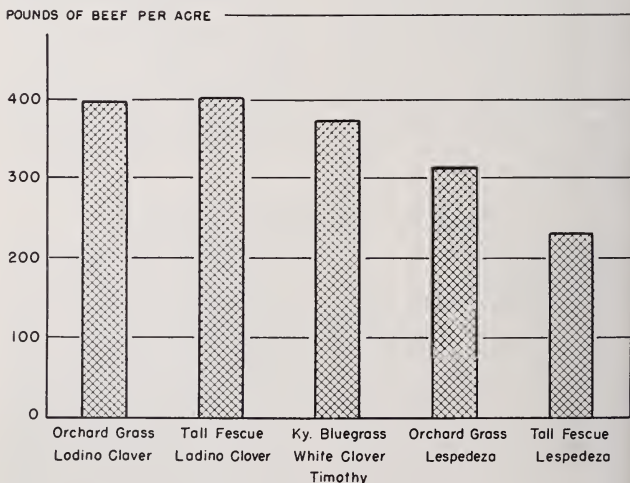
Hereford steers were pastured in a rotational grazing system, with each steer group remaining on a single mixture throughout the pasture season. Weekly weight gains were recorded as the animals were moved from one grazing area to another. The steers had free access to salt, minerals, and water.

The tall fescue-Ladino clover and the orchard grass-Ladino clover mixtures produced the most dry matter and beef per acre. The combination of Kentucky bluegrass, timothy, and white clover was in an intermediate position, and orchard grass-Korean lespedeza and tall fescue-Korean lespedeza were the least productive mixtures.

The forage production of the five pasture mixtures was studied at two levels of applied fertility, 400 and 700 pounds of 0-12-12 per acre each year. The results indicated that the higher fertility level brought the greatest response from the most productive three mixtures.

An important finding in the study was the fact that strips clipped at the time the animals were turned into each grazing area were as valuable in determining dry matter yields as the use of pasture cages which are left on the land while the animals are grazing. This finding will save labor and equipment costs in future studies.

Throughout the period of this ex-



Orchard grass-ladino clover and tall fescue-ladino clover mixtures averaged more beef per acre over two years of testing.

periment it was found that the animals gained much more rapidly during the spring of the year than during late summer and early fall. The larger part of the gain was made by early July. With this information in mind, new pasture studies have been started to determine ways in which pure stands of Korean lespedeza, common pearl millet, and sweet sudan grass can be used to increase the gains during the summer period. (*Project B-56j*)

Studies Show Pasture Renovation is Practical

Research was completed this year on a study begun in 1947 to learn the best methods of renovating pastures. Results show that when new seedlings are to be made in late summer or early fall, disking established sods is a better practice than shallow plowing in preparing the seedbed. It is interesting that exactly opposite findings apply to seedlings that are made in the spring. In this case shallow plowing proved superior to disking.

Information gained during this study showed that during the summer season, disking of Kentucky bluegrass and white clover sods resulted in a good kill of the plants present when disking was begun. With as many as three diskings, beginning in July and made at two-week intervals, good seedbeds could be prepared. New seedlings were established without injurious competition from the plants which had been growing on this land. Shallow plowing was better for spring planting,

largely because disking failed to eliminate competition from the original sod at that season of the year.

Among several mixtures tried, orchard grass and tall fescue, in combination with Ladino clover, red clover, and alfalfa, proved to be the most productive throughout the test, regardless of the time or method of establishment. On well drained soil, the addition of red clover and alfalfa to mixtures that contain Ladino clover increases the productiveness of these mixtures during the first two years after establishment. These studies also show that late summer seeded mixtures were in general more productive than those which were seeded in the spring.

Many Maryland farmers have been interested in methods by which these tall growing mixtures can be established on soils where normal seedbed preparation would result in loss of soil and water.

The results of these findings have been summarized and widely circularized in mimeographed form. Results have been rather consistent throughout the period of the study and now form the basis for Extension recommendations to farmers of the State. (*Project B-56-b*)

Promising Forage Varieties Tested

Maryland agronomists have joined with the Experiment Station workers in other northeastern states to test more thoroughly the promising forage varieties for this region. With seed production of many varieties of forage crops becoming a stable business in the western part of the



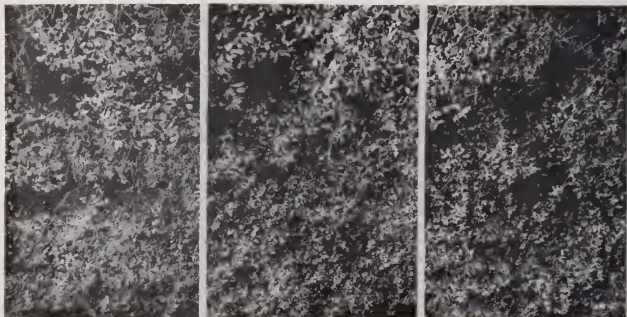
Leafiness, resistance to disease and insects, and maturity of grasses must be rated by observation.

United States, these cooperative tests have proved of great value in finding the areas where the particular varieties are best adapted, and in reducing the number of varieties that must be produced and maintained in pure

condition for farmers of this region. This is an important contribution toward volume seed production of forage varieties that give better yields on pasture and hay lands in the state.

The southern varieties of smooth brome grass proved more productive than the northern varieties. In the Maryland tests during 1952, Achenbach was the highest yielding variety, with Fisher as a close second, while Canadian Commercial, Martin, and Manchar gave lowest yields. The superiority of Achenbach was primarily due to higher yields at the first harvests during the season.

Commercial and Early Synthetic were the high yielding orchard grasses, with Beltsville and Medium Synthetic in an intermediate position, and Brage with somewhat lower yields. These differences in the orchard grasses tested were more apparent under silage-cutting management



Differences in productive ability of alfalfa varieties shows up as the stands grow older. After four years, Grimm (left) and Atlantic (right) have been invaded by weeds. Williamsburg (center) is still good.

than when the clippings were made to correspond to normal pasture use.

Williamsburg was the highest producing alfalfa variety. These results were similar to those found in tests throughout the eastern part of Maryland. In yield comparisons, Narragansett, Atlantic, A-225, Grimm, and Buffalo followed Williamsburg in the order given.

As has been reported in the past, birdsfoot trefoil varieties were not productive when compared to the other legumes tested. The disease *Rhizoctonia soleni* was found in abundance on all varieties and was an important cause for this low level of production. (Project B-56-f—NE-10)

Further Study Being Made of the Effect of Climate on Plant Growth

The particular climatic conditions associated with growing forage crops have a large effect on the way stands of these crops are maintained and how well they produce. To understand more clearly the effect of these weather conditions on various forage mixtures, a study is being made of the micro-climate surrounding several mixtures being grown at the Plant Research Farm. Research of this type is an attempt to learn crop response to varying micro-climate conditions, and is referred to as a phenological study.

Uniformity of forage cover over the soil has been found to be more important than the amount of forage in reducing heaving damage to plants during freezing and thawing. Frequent freezing and thawing has been

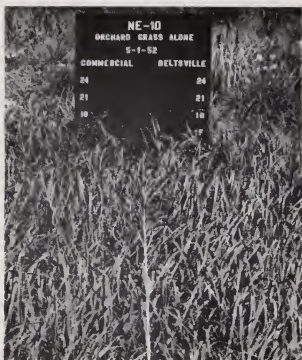
found to cause more damage than long cold periods when the soil remains frozen. This appears to be particularly true with Ladino clover. Older stands of Ladino clover have been almost completely eliminated in a single winter in many areas of Maryland. This has occurred once during the past three years at the Plant Research Farm. This winter loss of plants was found to be caused not only by weather conditions during the winter period but also by moisture distribution during the previous summer.

Winter heaving has also been measured in this research through the use of wooden pegs placed in various types of plant cover. The diameter of these pegs has been found to have little effect on the amount of heaving, but the depth at which they were placed and the type of soil cover proved important.

Similar studies are being made at several stations in the Northeastern region. Together they should give us a better understanding of the ways we can use climatic conditions to best advantage in crop production. (Project B-56-k)

State-wide Tests Made on Forage Strains and Varieties

To be of greatest value to Maryland farmers forage variety tests must be conducted in various areas of the State to determine the varieties and strains that will be most productive under the many soil and climatic conditions. These variety tests have shown that Williamsburg alfalfa is superior in persistence throughout



Beltsville orchard grass is leafier, more disease and insect resistant, and later than most commercial types. It is not yet available for farm use.

the State. The Narragansett variety is promising, especially for its capacity to resist weed competition. It also appears that Narragansett may be superior on fields which are imperfectly drained.

As was found during the previous year, the Rowan and Climax varieties of lespedeza are superior to the varieties which are in common use in Maryland at the present time.

A study of seven strains and varieties of pearl millet and ten of sudan grass showed several pearl millet strains to be promising in total yield, freedom from leaf diseases, and in recovery after cutting.

Pearl millet is not now used in the State for pasture or hay purposes. Promising results are being reported by southern stations when varieties of pearl millet are compared to su-

dan grass. These results from other areas, along with tests in Maryland, have led to plans for more extensive testing of these millets as a source of summer grazing.

Tualatin tall oat grass, growing with alfalfa, compared well with other grasses seeded with this legume, and showed the need for further testing to find the best grasses for use with alfalfa. (*Project B-56-1*)

Initial Phases of Red Clover Improvement Completed

Red clover remains the leading legume from the standpoint of acreage seeded for hay purposes. Many acres of the State are not adapted to alfalfa, and red clover must be depended on as an important part of the forage production for the livestock industry. Much additional research will be necessary to bring a better variety to farmers of the state.

Agronomists cooperating with plant pathologists are using the best Maryland strains and the highest yielding varieties from other areas as a source of material to develop better resistance to southern anthracnose. This disease causes much loss in red clover grown in the State.

These studies have shown that locally grown red clover is well adapted to the particular areas in which it has been maintained for a number of years. But most of these strains are not productive over large areas of the State, nor is sufficient seed available to plant large acreages. The Kenland variety has proved well adapted to most parts of Maryland,

but has not given consistently good results in the eastern part of the State.

In the initial phases of this breeding program many seedlings of the best available material have been subjected to controlled conditions under which southern anthracnose is introduced. These inoculations have eliminated a large percentage of the plants but a few seedlings have remained which show much promise for resistance to the disease. Fifteen to twenty lines showing promise have been selected. With selection completed, these lines are being combined into synthetic varieties and will be tested to learn how much real progress has been made toward better red clover. (*Project B-56-a*)

Search Continues for Better Ladino Clover

Agronomists at the Maryland station are growing 21 parent clones of the Beltsville strain of Ladino clover known as FC 23608. Under controlled conditions in the greenhouse, these clones are producing enough polycross seed for progeny tests throughout the Northeastern region. FC 23608 has been superior in general yield tests with other Ladino clover strains. This makes it important to compare more carefully the parental clones that make up this strain. Sixteen other clones found to be superior in the Northeast are in-

cluded in the polycross seed program so they too can be tested on a regional basis.

In addition, 22 clones of Ladino clover found superior in local tests are being studied as replicated spaced plants to further determine their value.

In this breeding program the principal objectives are to find Ladino clover strains that will be productive, long-lived, and will grow well in combination with productive grasses. (*Project B-56-g—NE-10*)

Selecting Better Orchard Grass Strains

Trials to determine the yielding ability and other important characteristics of polycross progenies of 89 orchard grass clones that have been selected during the last several years are under way at the Plant Research Farm. This test is giving an opportunity to evaluate the progress that has been made in this breeding program.

In addition, about 1,000 individual seedling plants of orchard grass are being studied to give opportunity for further selection.

While it will be several years before the best strains can be selected and thoroughly tested, the progress to date indicates that we can expect superior orchard grass varieties for pasture and hay uses as a result of this program. (*Project B-56-i*)

Soils

Tests Lead to Better Understanding of Phosphorus and Potash Needs for Alfalfa

Alfalfa was introduced into Maryland in the latter part of the nineteenth century and has become a very important hay crop. Despite the fact that it is grown successfully on many acres, crop failure is still common. In many instances this failure is related to a lack of soil fertility.

Field experiments were established on a Sassafras sandy loam and a Penn loam to study the yield and chemical composition of alfalfa grown under different levels of applied phosphorus and potash. Results of two crop seasons have been studied.

The Sassafras soil had received good fertilization in previous years and there was no response in these two crop seasons to different amounts of phosphorus and potash applied. On the other hand 80 pounds of P_2O_5 and 72 pounds of K_2O per acre gave an increase of 1.45 tons per acre on the Penn soil. This soil had not been fertilized heavily in past years.

Analysis of the alfalfa plant tissues showed that applications of muriate of potash to the soil usually reduced the phosphorus content of the alfalfa and that an increase of magnesium in the plant was usually accompanied by an increase of phosphorus. These tests also showed that minimum to near maximum yields of alfalfa were obtained without a

significant change in the phosphorus level in the plant tissue. In this research the response of the alfalfa indicated that when the potassium reached a level of 1.4 per cent in the plant and the phosphorus a level of 0.20 per cent, there was enough of each for the plant to make optimum growth.

Throughout these tests plenty of lime and boron were available for the growth of the alfalfa plants.

Studies of this type, using soil and plant tissue analyses, are giving a better insight into the use of fertilizer that is applied to the soil. They will no doubt have an important bearing on future recommendations for maximum efficient alfalfa production. (*Project 0-51*)

Effect of Soil Conditioners on Crop Yields Studied

The fertility requirements of crops are reasonably well understood and many studies have been conducted to give information on nutrient needs of crops. The importance of structure or physical condition of the soil has received less attention. This has been due mainly to the difficulty of separating the crop responses to soil structure from responses to differences in fertility. The recent introduction of soil conditioners has given soil scientists a new tool to study the effect of soil structure on crop response.

Soil scientists at the Maryland Plant Research Farm are studying various crop rotations as they affect

soil physical condition and crop yields. In this study half of each plot has been treated with a soil conditioner and the other half has been left untreated.

With one full year of results available, few differences are showing in the crop rotations. This is to be expected. The soil conditioner used produced increases of about 11 per cent in field corn yields, 17 per cent in sweet corn yields, 17 per cent in oat yields, and had no effect on the yield of soybeans. Examination of the soil showed that the tilth of the treated soil was much better than that on the untreated soil.

Soil conditioners are expensive and are not practical for field operations at the present time. They have proved, however, to be very valuable in helping to understand the effect of soil physical condition on crop productivity. These tests are a part of a concentrated study of the importance of soil physical conditions in the Northeastern states. (*Project 0-53—NE-11*)

Soil Tests Being Developed to Measure Phosphorus Availability to Plants

Seventeen soils from various areas of the state are being studied at the Plant Research Farm. These have been placed in containers to correspond with field conditions to learn ways in which soil tests for available phosphorus can be improved. Work is under way to analyze both the soil and the tissue of plants grown on the soil, to learn more about the availability of phosphorus when ap-



Soil and air temperatures and soil moisture content can be studied any time during the year with this apparatus. The sensing elements are exposed here.

plied at different rates on these various soil types. (*Project 0-52*)

Fertilizer Studies on White Potatoes Continuing

Recent studies on fertilization of white potatoes in Garrett County have centered on the use of higher rates of fertilizer when potatoes are grown in a 3-year rotation with oats and red clover. Wide differences have been found in the response of white potatoes to applied fertilizer from one season to another. Three years of results have been obtained and the tests are to be carried through a fourth year to learn what responses can be expected under various seasonal conditions.

TABLE 1. A Nine Year Average of Corn and Wheat Yields Obtained with Different Sources of Phosphorus

Phosphorus Carrier	Corn (Bu.)	Wheat (Bu.)
Potassium Metaphosphate	62.9	21.6
Calcium Metaphosphate	63.0	21.9
Fused Rock Phosphate	63.3	22.4
Rock Phosphate + Gypsum	55.2	14.7
Fused Rock Phosphate + Gypsum	66.2	23.3
Superphosphate	65.3	23.1
Rock Phosphate	61.5	15.6
Rock Phosphate*	62.9	17.1
Rock Phosphate + Sulphur	61.7	16.0

*All phosphate carriers applied to give the same P_2O_5 per acre except this treatment in which rock phosphate was supplied to give four times the amount of P_2O_5 supplied by the other chemicals.

When growing conditions are favorable, large differences in response are found, ranging in 1950 from 270 bushels per acre to more than 500 bushels per acre. In drier seasons, such as 1951 and 1952, smaller differences were found, but heavier rates of fertilization still returned a worthwhile profit. In 1952 important differences were found in the response of the Kennebeck and Ontario varieties to various fertilizer treatments. (*Project 0-28-b*)

Phosphorus Carriers Compared for Phosphate Availability

Different forms of phosphorus are available for the use of Maryland farmers. Nine years of results have been collected to study the effect of these various phosphorus carriers on corn and wheat yields. The results are shown in Table 1. (*Project 0-45-b*)

Agronomists Aid in Studies of Conservation of Moisture and Soil

Agronomists have been working with the Research Division of the Soil Conservation Service to study

the effect of several land use practices on peak rates and total accumulated water run-off from watersheds at the University of Maryland Plant Research Farm. In this work, personnel of the Soil Conservation Service have collected the run-off data under various uses of terraces, waterways, dams, and cropping systems. The results of these treatments are helping to fit erosion control practices more accurately to individual farm situations.

Recent findings show that when the pasture furrows were removed from a Kentucky bluegrass-white clover watershed and the land was renovated by disking and liming and fertilizing the soil, a good mixture of orchard grass, Ladino clover and red clover increased yields. In the first year after establishment the total yield of hay equivalent grass silage and pasture was 4.75 tons per acre. Even under this high yield, absence of pasture furrows resulted in greater run-off of water from this area. (*Project 0-43*)

Tobacco



This improved strain of tobacco, RWM 16, is resistant to root rot, wild fire, mosaic, and fusarium wilt.

New Ways Found to Increase Tobacco Yields

With acreage control of Maryland tobacco in effect for the first time in 1953, farmers are seeking means of improving yields on their reduced acreages without sacrificing quality. Tests in progress at the Tobacco Experimental Farm indicate that the two goals are compatible. When plants were spaced to obtain a population of 7,500 plants per acre as compared to 5,000 plants per acre, the larger population of plants increase the yield by 300 pounds per acre of cured crop. Further increase of the plant population to 10,000 plants per acre gave 75 pounds less

of cured crop than was obtained at the 7,500 plant level.

A fertilizer rate of 1,500 pounds per acre outyielded a 750 pound rate by 230 pounds of crop, while 2,000 pounds of fertilizer gave an increase over the 1,500 pound rate of only 100 pounds of crop. Broadcasting proved a better method of applying fertilizer than either bands or row treatment. This was especially true at higher rates of fertilization. (*Project B-60*)

Quality and Yield of Maryland Strains Studied

In cooperation with the Maryland Tobacco Improvement Foundation, Inc., a series of tests were conducted

to determine the yield of established strains of Maryland tobacco. The cured crop was graded and the market value was determined.

Three years' results from tests of strains of Maryland tobacco show that three broadleafed types, Posey, Wilson, and Keller, are grouped in yield near 1,300 pounds per acre when grown under disease free conditions, but are not disease resistant. The Catterton variety, which is resistant to black root rot, had 88 per cent of the yield and 90 per cent of the value of the three broadleaf types. The Robinson variety, which is resistant to Fusarium wilt, had 92 per cent as much yield as the productive strains and 83 per cent of the value. An unreleased strain, RWM 16, resistant to both the above diseases, and also to mosaic and wildfire, nearly equaled the best strains, with 96 per cent of the yield and 98 per cent of the value.

The three high yielding strains were also the highest in nicotine content, with averages of 2.28, 2.71 and 2.36 per cent total alkaloids for the Posey, Wilson, and Keller strains, respectively. By comparison, Catter-

ton contained 1.61 per cent and Robinson 1.58 per cent of total alkaloids, while RWM 16 contained 1.42 per cent.

For the quality of Maryland tobacco to be maintained under increasing yields per acre, it is important to keep the total alkaloid content at a low level. (*Project B-64*)

Methyl Bromide Finds Wide Use As An Effective Soil Fumigant

Details of how methyl bromide can be used as a soil fumigant have been determined from experimental work and have been described in detail for farm use. A much wider farmer acceptance of methyl bromide for fumigation for weed and disease control in tobacco seedbeds was noted this past season.

The reduction in weed population which this method gives in tobacco seedbeds has been reflected in much less time needed for weeding the beds, an increase in vigor of the tobacco plants, and a decrease in mosaic on these plants. Studies are being started to further explore ways in which tobacco seedbed management can be improved. (*Project B-59*)

Weed Control

Chickweed Control in Fall Seeded Alfalfa Gets Further Study

Chickweed has continued as a major problem in alfalfa fields in the State. Previous experiments have shown that one pound per acre of acid equivalent of DNOSBP (4,6-dinitro-ortho-sec-butylphenol) will

give temporary control of chickweed without injury to the alfalfa seedlings. In using this treatment it is often necessary to repeat applications twice during the winter season to insure reasonable control of the chickweed growth.

Tests on seedling alfalfa stands



One-fourth pound of MCP controlled most of the weeds in the alfalfa at right. Although the alfalfa was shortened by the application, total seasonal yields from this plot were as high as from the plot at the left. More research must be done before MCP can be generally recommended.

during the winter of 1951-52 in Baltimore County indicated that CIPC (isopropyl-N- (3-chlorophenyl)-carbamate) could be used effectively with a single application to control chickweed during the winter season. These tests indicated that CIPC at four pounds per acre would stunt the alfalfa plants in the spring, and would decrease the first crop yield. These applications also eliminated grasses seeded in mixture with the alfalfa.

During the winter of 1952-53 a trial was conducted in Howard County on seedling alfalfa and Ladino clover stands to study several promising chemicals for control of weeds. Data from this experiment show that CIPC applied at two pounds per acre during the winter season can give effective control of chickweed without objectionable in-

jury to alfalfa or Ladino clover. Smooth brome grass growing in association with these legumes survived the fall treatments with CIPC.

A combination treatment of CIPC and MCP (2-methyl 4-chlorophenoxyacetic acid) gave much promise for the control of chickweed, winter cress (*Barbarea vulgaris*) and Methodist weed (*Lepidium campestre*). Earlier tests had shown that control of chickweed alone was not sufficient in seedling stands of alfalfa as other weeds were competing with the alfalfa plants. The tests of this year show much promise toward an effective field control program for troublesome weeds.

In addition to the use of chemical herbicides for weed control in alfalfa, new research is being conducted to study the effect of various seed and fertilizer placement methods on the

rapidity with which alfalfa stands are established and the relationship between this establishment and weed competition. (*Project B-58-b*)

Calcium Cyanamid and 2,4-D Weed Control Studies in Corn Continued

Tests were conducted at two locations during the past growing season to compare the use of 2,4-D and calcium cyanamid with cultivation for the control of weeds in field corn. These tests show that 2,4-D is an effective pre-emergence treatment for control of broadleaf weeds and will also reduce the competition from many weed grasses.

Calcium cyanamid, applied at the rate of 400 pounds per acre in 18-inch bands over the corn rows before emergence of the corn, was also found effective in reducing early weed competition. Both of these treatments helped eliminate the need

for the first cultivation that would be necessary where no herbicide was used. This first cultivation is a costly, time-consuming job which comes when farmers are busy with many other crop production operations on the farm.

The principal use of calcium cyanamid appears to be on soils where there is need for additional nitrogen to obtain maximum yields of corn. In these situations the single application of calcium cyanamid serves both as a herbicide and as a source of the needed nitrogen. Where a high nitrogen level exists from previous fertility treatments, 2,4-D was found to be a less expensive herbicide. Throughout these tests some cultivation was found to be necessary if maximum yields were obtained. (*Project B-58-a*)

Seed Inspection

During the spring of 1953, retail seed distribution points throughout the State were visited and approximately 360 samples were collected to determine the accuracy with which these seeds offered for sale to Maryland farmers were labeled. This year the collection was centered on the farm crops in which improper labeling had been observed. The laboratory analyses of these samples is being completed and a summary will be prepared so that Maryland farmers may judge the accuracy of

labeling of seeds sold by various organizations.

Farmers and seedsmen in the State submitted 2,775 seed samples for examination by the Seed Laboratory. This gave Maryland farmers a chance to see the quality of seed that was being used on their farms. In addition to analyses of seed lots, 477 samples of tobacco were cleaned in the Seed Laboratory and germination tests were made so that farmers could more accurately gauge the planting of this seed. (*Projects N-7, N-8, N-9*)

Animal Husbandry



Swine research center at College Park.

Research in Animal Husbandry is centered primarily around the development of new techniques for the evaluation of beef breeding animals, the testing of the performance of the Maryland Number One breed of swine, and studies on bloat in ruminants.

In carrying out these projects, the department of Animal Husbandry cooperates with other departments within the Agricultural Experiment

Station such as Agronomy, Dairy, and Livestock Sanitary Service, as well as with owners of livestock in the State and the U.S.D.A. Research unit at Beltsville, Maryland.

Research workers in animal husbandry enjoy the close cooperation of Extension workers in the department, not only in the distribution of knowledge gained through research but also counseling and assistance on some of the projects.

Beef Cattle

New Method For Earlier Evaluation of Rate of Gain in Beef Calves Seems Possible

Studies involving the individual feeding of beef calves have been in progress for four years. The first phase, that of establishing sound feeding and management practices has been completed, and the second phase, that of testing the degree of inheritance of rate and efficiency of gain, has been started.

A summary of the data from the first phase of the research indicates that after weaning, the rate of gain

during successive 28-day feeding periods is much more uniform for calves weaned at 90 days of age than for those weaned at six months. Calves of each weaning age averaged 32 pounds gain during the first 28-day period after weaning. After 146 days of age, the calves weaned at 90 days gained an average of about 46 pounds per 28-day feeding period and varied only one or two pounds from that average during the 28-day periods from 146 to 370 days of age. Calves weaned at 180 days of



Calves are fed in individual stalls so that careful records can be made.

age averaged about the same rate of gain after 202 days as did the 90-day group. The amount of gain fluctuated as much as 13 pounds from one period to the next; exhibiting a definite saw tooth pattern. The fluctuations indicated that a relatively long feeding trial would be necessary to get an estimate of the average gain, that is a short period would have a low predictive value.

The research was designed so that some information relative to possible inheritance of rate and economy of gain could be secured during the first phase. A reasonable number of full-and half-sibs (brothers and sisters) have been fed out to give an indication of the amount and kinds of differences existing among the progenies of different cows in the University herd. Table II shows representative data secured from three cows. Calves of cows A and B were nearly the same average

weight at one year of age (624 and 612 pounds respectively) but differed about 80 pounds (612 and 530 pounds) in average T.D.N. requirements for growth and maintenance per hundredweight of gain. The main difference between the calves of cows B and C was in average weight at one year of age (612 and 739 pounds). This difference seems real even though allowance is made for usual differences between gains of steers and heifers.

Economy and rate of gain are characteristics for which to select in addition to type. From an over-all economic aspect it is interesting to note that cow C's calves not only averaged the most in weight at one year of age and consumed the least average amount of T.D.N. per hundred weight of gain plus maintenance (519 pounds) but also had the best conformation scores of any of the three groups of calves. (*Project C-14-a*)

Table 2. Weights, gains, and feed requirements of calves of different dams for ages and feeding periods indicated.

Cow No.	CALF						
	Year of Birth	Weight at Age			Average Daily Gain		T.D.N.* per 100 lbs Gain Plus Maintenance
		Birth	180	370	Birth-180	180-370	
A	1950	67	366	687	1.66	1.69	590 (738)
	1951	70	340	660	1.50	1.68	558 (698)
	1952	62	295	525	1.29	1.21	687 (859)
B	1950	50	278	580	1.27	1.59	520 (650)
	1951	60	335	660	1.53	1.71	571 (714)
	1952	38 ¹	290	595	1.49	1.61	500 (625)
C	1949 ²	70	370	732	1.67	1.91	530 (663)
	1950	71	446	750	2.08	1.60	500 (625)
	1951	71	340	735	1.49	2.08	528 (660)

* T.D.N. refers to total digestible nutrients. To transform these figures to pounds of corn, multiply number of pounds T.D.N. by 1.25. Number in () are corn equivalents of T.D.N. figures.

¹ Twin calf.

² All calves within cow groups were full sibs except this one calf.

Importance of Muscle Stands Out in Carcass Studies

Further analysis has been made of the data secured from steers representative of many that reach the market. Twenty different measurements taken on the live animal were

correlated with two different sets of wholesale cuts; (a) round, loin, and rib and (b) round, loin, rib and square cut. Depth, length and circumference measurements were taken at various points on the body.

After the effects of differences in



This newly completed beef barn at the animal husbandry farm in Howard County will permit additional research work.

bodily weights had been removed, it was found that these measurements had little if any use for forecasting the weights of the cuts. Width of shoulders and depth of twist were the best for estimating (a) while these same measurements plus width of hooks were best for estimating (b).

The weights of seventeen wholesale cuts were correlated with each other as well as with live weight and slaughter grade. The cuts were again correlated with the effects of variations in live weight and slaughter grade removed. Significant correlations were: rib with short loin and flank, plate with flank and kidney knob, square cut with sirloin butt and round, fore quarter with trimmed loin and round short loin with rib and sirloin butt, and round with square cut, sirloin butt and flank.

Some cuts were rather highly correlated even though the muscles and bones were entirely different. Some cuts such as the short loin with the sirloin butt and rib were naturally correlated because of similarity or exactness of muscle structure.

In general, meaty cuts were rather highly correlated with other meaty cuts indicating that careful selection for muscling in one part would help in selection for another but perhaps less visible part.

The relationship of some primarily-muscular cuts to the flank suggests further inquiry regarding the fattening processes of the animal. It is indicated that thickness of body wall in the flank region may be an

important indicator of the deposition of fat and might be useful as an earlier indicator of fattening than the laying down of fat along the lower border of the flank. (*Project C-14-c*)

Detergents Tested as Possible Bloat Preventive

The problem of bloat and the death loss from it is becoming increasingly serious to Maryland beef producers. The rise in incidence of bloat seems to parallel the improvement in pastures and it is especially troublesome on pastures that are predominantly Ladino clover. During the past year experiments have been started to explore the possibilities for some simple, practical means of preventing bloat when cattle or sheep are exposed to conditions conducive to bloating.

It is possible that alteration of surface tension, or other physical properties of the rumen contents may effect the incidence of bloat; and that detergents or other surface active agents could be beneficial when fed to cattle or sheep on pasture. With this in mind, six Hereford steers were placed on a feeding trial to determine if a detergent would affect the rate of gain or general health of cattle. Three of the steers were fed a detergent (Procter and Gamble's E-800, the active ingredient of Dreft) at a level of one per cent of the concentrate allowance. E-800 fed at this level for 90 days has had no apparent harmful or beneficial effects upon the animals. After 90 days of feeding detergent in the con-

centrate, E-800 was added to the drinking water in an amount equivalent to that previously received in the feed. The steers consumed the detergent at the levels fed quite readily either in feed or water.

As yet, no evidence has been obtained that surface active agents will

be helpful or harmful in controlling bloat. Much more work will be needed to determine effects of such feeding, and to find the most satisfactory and practical methods of administration in case the feeding of such materials should be desirable. (*Project C-18*)

Sheep

Materials Tested for Control of Pregnancy Disease of Ewes

Pregnancy disease in ewes appears in many ways to be similar to ketosis in dairy cattle and causes considerable loss to sheep raisers in Maryland. Sodium propionate and sodium acetate have been found to be effective in treating bovine ketosis and it is possible that such materials may be helpful in pregnancy disease of ewes.

During the past year feeding trials have been initiated to study the effects of sodium propionate on the pregnant and lactating ewes and upon young lambs. Ewes were fed propionate in the grain mixture and propionate was added to the creep feed for the lambs. Preliminary observations indicate that propionate will not affect the blood glucose levels of normal ewes during late pregnancy and early lactation. The

ewes in this trial were all liberally fed and maintained body weight quite well after lambing with no apparent differences due to propionate feeding. Hampshire lambs fed propionate in the creep mixture for 56 days showed slightly larger gains than a group of similar lambs not receiving propionate. However, Southdown lambs receiving propionate in the creep and nursing ewes receiving propionate have not gained more and do not appear as thrifty as Southdown lambs that are not receiving the material. No real evidence has as yet been obtained that propionate will effect the performance of ewes and lambs. More data, now being collected, and the analysis of such data should reveal more about the influence of propionate. (*Project C-21*)

Swine

Tests Continue On Meat Type Pig

Litter size, weaning weights, rate of gain and feed requirements are being secured on the herd of Maryland Number One swine. These pigs are being fed in individual litter-

lots. The results secured to date indicate that these swine perform satisfactorily. Pigs of this line will be released to farmers as rapidly as surplus stock is available. (*Project C-20*)

Animal Pathology

Tests on Vaccine Control of Brucellosis in Cattle Continued

Further study of vaccination as a control measure for brucellosis has indicated, at least experimentally, that Bang's disease-free herds may be established, mainly through vaccination. A combination of calfhood and adult vaccination, and occasionally revaccination, was used in the experimental work.

Calves were vaccinated at about six months of age, at which time they appear to develop a satisfactory resistance to Bang's disease; and almost all the animals return to a negative status within a few months.

It has been known for some years that adult vaccination apparently produces a lasting immunity in cattle. However, not more than 10 per cent of these animals are negative one year after vaccination. Since no satisfactory method has been devised to differentiate between reactions due to vaccination and those due to actual infection, cows maintaining such reactions over a period of years present a real problem in diagnosis. While in the experimental stage, it would appear that original adult vaccination with reduced doses of vaccine (from one-fourth to one-tenth the normal dose) produces sufficient immunity to prevent spread of the disease in a herd and, at the same time, has the advantage of producing

vaccination reactions which do not tend to remain over a period of years. Revaccination with booster doses of vaccine at yearly intervals seems to maintain resistance.

Revaccination of previously vaccinated calves with small doses of vaccine may be used to bolster the resistance of animals placed in heavily infected herds. (*Project D-46*)

Anaplasmosis of Cattle Under Study

Anaplasmosis is an infectious, febrile disease that causes severe anemia and jaundice and is one of the major disease problems of the cattle industry. It has been prevalent in the southern states for twenty-seven years and is now found in several of the northern states.

In most cases the infection is transmitted by biting insects, and as a result it is usually thought of as a summertime or warm weather disease. This is not always the case, because the disease may be spread by infected instruments such as syringes, dehorning shears, and castrating equipment used on a carrier animal and then on non-infected animals without first being sterilized. In such cases the disease may appear any time during the year.

The complement fixation test for detection of carrier animals is now under study at the Live Stock Sani

tary Service Laboratory, College Park. Results so far give promise of a practical means for the detection of animals infected with anaplasmosis. (Project D-50)

Basic Research on Ruminant Metabolism and Ketosis Under Way

Fundamental research on the metabolism of cattle, sheep, and goats is being continued. It is becoming increasingly apparent that ruminants differ in so many ways from the common laboratory animals that studies on ruminants themselves must be greatly increased to develop adequate nutritional standards and to understand the changes occurring in disease.

Using a somewhat different approach to the problem of ketosis from that used by the Dairy Department in its work with hormones, this project has been directed toward finding a source of glucose for the ruminant that is not destroyed in the rumen. Last year it was reported that glycerol is effective. Studies carried on this year indicate that propylene glycol is equally effective and is considerably more economical. Enough data have not yet been collected to recommend the material for general use. (Project D-53)

Tests Shows Infectious Bovine Mastitis Can Be Controlled

A group of herds that had experienced serious and costly mastitis outbreaks has been gathered under a program of control, frequently tested by bacteriological methods, and treated at proper intervals with the most suitable drugs.

Clinical disturbances have almost entirely disappeared, milk production appreciably raised, and bacteria counts considerably lowered. Best results were obtained:

1. Where the routine milking technique permits *fast* and complete *milking* of the udders.
2. Where one of the most serious mastitis offenders, *Streptococcus agalactiae*, was completely eliminated from the udders and therefore from the premises.
3. Where special effort was made to prevent the *combination moisture-filth* from coming in contact with the udders. (Project D-54)

Search for Newcastle Disease Vaccine Continues

The hamster vaccine developed at the University of Maryland Agricultural Experiment Station has not been accepted by commercial producers because of production problems. This year's studies are centered in changing the virus by growing it in living tissue cells, rather than in living animals. There is evidence of changes in the disease-producing properties to indicate that a satisfactory modification may be reached after continued cultivation.

In the previous work there has been indication of some relationship between the viruses of Newcastle disease and poliomyelitis. Studies with several different strains of Newcastle disease virus showed that one from Minnesota protected monkeys against challenge with poliomyelitis virus to a greater extent than the others tested. During the current year it was

shown that monkeys injected with the Minnesota strain were fully protected against the Lansing strain of poliomyelitis virus and partially protected against the Brunhilde strain of the same virus. One of two chimpanzees was protected against the latter strain. All animals which showed no symptoms from the injection of poliomyelitis virus showed no changes in the central nervous system. It would be remarkable if the scourge of the poultry industry should prove to be the means of controlling the scourge of the human race. (*Project D-52*)

Only Tested Drugs Should Be Relied Upon for Blackhead Control

Indiscriminate use of drugs to control blackhead in turkeys and chickens should be avoided. Current investigational work in the Department of Animal Pathology has shown some of these treatments to be of no value.

Enheptin, however, has been proved satisfactory as a control

agent. When properly administered, this drug is one of the few economical forms of treatment discovered to date. Because of the sometimes harmful side effects of enheptin on egg production and hatchability, trials were conducted with the drug at a lower concentration than is ordinarily recommended. The administration of enheptin at the 0.025 per cent level, however, failed to prevent the disease. Likewise part time or intermittent feeding of the drug proved ineffective. While enheptin treatment places the disease under control and stops its spread, symptoms of the ailment may appear in the flock rather quickly after treatment is stopped because of parasites left buried in the intestinal (cecal) wall.

Recent investigations have shown that the blackhead parasite is not dependent for its disease producing power upon bacteria often-times associated with it in body tissues. (*Project D-51*)



A Maryland plant pathologist pollinates a Maryland strain of tobacco with pollen from a disease resistant strain. The problem is to get disease resistance without lowering quality or yield

Botany

Research in the Department of Botany proceeds along several specific lines. Among them are plant breeding, plant physiology, and plant pathology. The final objective of the research scientists who work on the various projects is to help foster better living by pointing the way to greater efficiency in agriculture. Much of the research is of the so-called practical type, yielding results which may be applied immediately to solution of problems in the field. But the more basic aspects are not overlooked because research scientists realize the necessity of anticipating future needs.

Plant Breeding

Plant "Twins" Are Aid to Plant Breeding Research

The plant breeders of the Department of Botany are studying twin and triplet seedlings. Like the more familiar twins of animals, twin plant seedlings may be separate or partially conjoined. As is the case in animals, the tendency towards twinning is also inherited in plants. Varieties having low, intermediate and high frequencies of multiple seedlings have been found in the garden pepper.

However many twin seedlings of

plants differ fundamentally from animal twins in their mode of origin. When pepper twins are isolated from crosses between varieties with contrasting inherited characters, some members show inheritance only from the maternal parent. Such "haploid" twin seedlings have only one set of hereditary factors in contrast to normal seedlings which have two sets, one from each parent.

The haploids obtained from twin seedlings are treated with the chemical colchicine to double the number of hereditary units and produce true breeding or "homozygous" lines. Thirty different homozygous lines of peppers have been produced by this technique. Several lines are being field tested in comparison with standard varieties.



A field-grown plant of doubled haploid pimiento pepper.

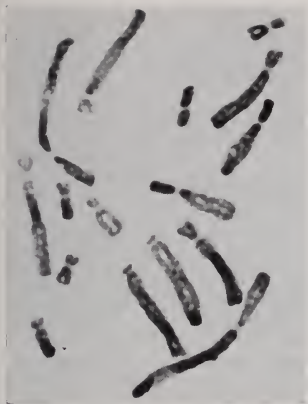
Recently, the plant breeders discovered that X-raying of the pollen greatly increased the number of twins and triplets in the resulting seeds of corn and regal lily. Since the haploids occurring in twin seedlings are useful in plant breeding, the induction of twins and haploids by means of X-ray treatment is being intensively investigated. The National Science Foundation has recently supplied a specially designed X-ray unit to further the progress of this project. (*Project F-15-A*)

Lilies and Blood Lily Studied for Information on Plant Breeding

Basic information concerning the mechanisms of heredity is a prerequisite to success in plant breeding. Recently University of Maryland botanists have been concerned with the relation of chromosome number and chromosome structure to speciation in lilies and *Haemanthus*, an ornamental related to amaryllis. These two plant groups have chromosomes particularly well suited for detailed studies.

Vegetative habit, floral structure and chromosome number were found to be correlated in *Haemanthus*. Species having thin leaves and large groups of flowers have 18 chromosomes. Species having thick leaves and smaller, less dense flowers have 16 chromosomes. The chromosomes of these plants were found to be unique in their range in size and clarity of structure.

Studies are in progress concerning hybridization of native lily species. Methods for obtaining rapid



Details of chromosome structure are very clear in *Haemanthus coccineus*. They occur in pairs, one member from each parent.

increase of valuable lines of the Easter lily are also being developed. It has been found that a rapid increase may be obtained from small bulbs produced by stem cuttings. It was observed that treatment of the stem cuttings with root inducing hormones led to a significant increase in the number of small bulbs produced. (*Project F-9*)

Plant Physiology

Increased Movement of Growth-Modifying Substances Possible with Application of Boron

It has been observed and reported by others that the movement of plant growth-modifying substances depends on the movement of photosynthate (sugars) from leaves of plants. Workers at the University of Mary-

land Agricultural Experiment Station have established a role of boron in the movement of sugars in plants, so a cooperative study was begun between the Station and the U. S. Department of Agriculture to determine if boron could indirectly increase the movement of growth-modifying substances in plants.

Research demonstrated that boron causes a marked increase in the entrance and movement of applied plant growth-modifying substances, presumably through the stimulatory effect of boron on the movement of



Boron increases the effectiveness of growth regulators in the laboratory and greenhouse. Plants at left had solution of sucrose and 2,4-D applied to right primary leaf. Plants at right received same solution plus boron.

sugar. This discovery has interesting possibilities in the field of plant hormones and several are currently under study. (*Project K-8-C*)

Leaf Analysis as a Guide in the Mineral Nutrition of Plants

Continued comparisons between the composition of plants and their ultimate yields suggest that it will be possible, some day, to determine "sufficiency values" for the various

essential elements in plants. To determine these values precisely, it will be necessary to make many comparisons between composition and yield over a period of years. Once these values have been found for various crop plants, they will be a great help in evaluating plant analyses and in the efficient use of fertilizers.

Evidence to date indicates that the balance among the various inorganic constituents in plants is of comparatively little importance. Similar yields occur with wide variations in the proportions of the various elements in plants, so long as each of the essential elements is present at the "sufficiency level" or above. (*Project K-8-B*)

Plant Pathology

Research on Identification and Control of Plant Virus Diseases Continues

Virus diseases are common in Maryland crops and are of special importance in production of peaches, potatoes, strawberries, tobacco and tomatoes.

Strawberries. Tests on control of the virus disease complex of strawberries have been continued under field conditions. Tests indicate that it is now possible for nurserymen to produce virus-free strawberry plants. This is accomplished by isolating new plantings about 3,000 yards from other strawberries and by regular application of parathion dust. This gives satisfactory control of aphids which spread this virus disease. Some strawberry varieties such as Temple, Blakemore and Howard-17 have natural resistance to this virus trouble.

Peaches and other stone fruits. Virus diseases are becoming of increasing importance in production of various stone fruits. Sour cherry

yellow and necrotic ring spot caused some trouble to sour cherry. In some areas considerable defoliation resulted from this disease. Peach yellow, which once caused such serious loss in Maryland, is still present in a number of orchards. Phony peach apparently no longer occurs in Maryland, for surveys on the Eastern Shore failed to disclose this virus disease on peaches or wild plums. Studies are being continued on determination of methods of spread of virus diseases so that better control measures may be obtained. Work with nurserymen and growers on field control of virus diseases of peach and cherry continues.

Ornamental plants. Preliminary studies are being made to determine the severity and nature of various virus diseases affecting commercial production of various ornamental plants. (*Project J-88*)

Development of Disease-Resistant Varieties of Tobacco

During the past three years an intensive breeding program has re-



Temperature chambers used in black shank and Granville wilt resistance tests. Soil temperatures above 80 F. are needed for tobacco to become infected.

sulted in the development of tobacco hybrids which are resistant to black root rot, wildfire and mosaic. A number of these plants approximate the quality of standard com-

mmercial types of tobacco. By crossing one of these resistant plants to Robinson, which is resistant to Fusarium wilt, hybrids were obtained having resistance to four of the more serious tobacco diseases. Some of the better lines are being tested under growers' conditions. They yield as well as standard varieties and have good quality.

Black shank was found on 28 Maryland tobacco farms in 1952. This serious disease presents a definite threat to production of tobacco in Maryland. Research continues on development of resistance to this disease. Some hybrid lines have been obtained which are fairly promising. A further objective is to incorporate resistance to black shank and Granville wilt in the same plant. Crosses will be made with various types of tobacco to combine further types



Soil of H, I, and B was inoculated with fungus causing black shank of tobacco. Soil of H and I was then treated to kill fungus. Note increased growth compared to control plant CK, which was uninoculated and untreated.

of resistance into individual varieties.

Another phase of tobacco breeding has dealt with resistance to the anthracnose disease. Crosses have been made between Maryland tobacco and a number of species of *Nicotiana* which have varying degrees of resistance. Since the causal fungus segregates into at least six races, each must be tested. Artificial and natural infection has shown that various weeds, grasses and cultivated plants may also be affected by the anthracnose fungus.

Laboratory tests have been conducted on 42 chemicals for potential value in control of the fungus which causes black shank of tobacco. Nineteen of these chemicals were very toxic to the fungus and will be tested in the greenhouse as soil treatments. (Project J-89)

Search Continues for Disease-Resistant Potatoes

Diseases of potatoes cause serious losses each year and make necessary the search for resistant varieties which are adaptable to Maryland conditions. In early season test plots in 1952, Cherokee, Katahdin, Kennebec and Pontiac yielded more U. S. No. 1 potatoes than Irish Cobbler. In the late plot early blight was severe and it was found that Sebago and a seedling (B355-44) were not severely injured. This seedling and Kennebec outyielded Irish Cobbler in bushels of No. 1 potatoes. Kennebec, Canso and Keswick showed low infection by the potato scab disease. Keswick was especially

susceptible to black scurf. (Project J-90)

Field and Laboratory Tests of Fungicides Continued

In tomato spray plots at Salisbury early blight and gray leaf spot were the principal diseases present in 1952. Early sprays of ziram followed by several applications of copper were very effective in controlling disease and increasing yield. Zineb, manzate and several experimental fungicides were also very effective. In plots near Beltsville these materials also gave good control of anthracnose and increased the yield of marketable tomatoes. In cantaloupe spray plots several materials such as zineb and ziram were effective in reducing defoliation but in 1952 there were no increases in yield. Results from these experimental plots should result in more efficient production of vegetables for processing and for the home market.

To gain a better understanding of how fungicides work fundamental research has been continued. It has been found that the organic fungicide, thiram, has an inhibiting effect upon two enzymatic reactions in yeast cells. It is possible that the fungicide causes similar reactions in fungi which cause plant diseases. Work along this same line has been initiated with certain other organic fungicides. (Project J-87)

Studies Continued on Adaptability of Control Practices to Commercial Production of Sweet Potatoes

Basic studies are under way on the relationship of certain antagonis-



Soil samples from Eastern Shore strawberry fields are checked for red stele fungus.

tic organisms to fungi causing diseases of sweet potatoes. It has been found that various soil organisms prevent growth in culture of the fungus which causes black rot of sweet potato. This antagonist also retards growth of several other plant pathogenic fungi such as *Rhizoctonia solani* and *Ceratostomella ulmi*. The nature of the active substance causing this antagonistic effect and its possible use for control of plant diseases are ultimate objectives. (Project J-86-A)

Occurrence of Several Races of the Strawberry Red Stele Fungus Greatly Complicates the Problem of Developing Varieties Resistant to This Disease

In addition to resisting several strains of this fungus, a worthwhile strawberry variety must also be resistant to leaf spot, leaf scorch and powdery mildew. When all of the

other additional qualities of a good commercial strawberry are added to the above requirements it is readily obvious why thousands of seedlings must be tested in order to obtain even a few that have all these features. Fortunately this has now been accomplished in Maryland-U.S.D.A. selections 2101, 2149, 2159, 2188, 2210 and others.

To obtain some indication of occurrence of races of the red stele fungus in Maryland, samples of soil from diseased plantings were studied in the greenhouse. A series of resistant and susceptible plants were placed in each soil and by their reaction to the red stele disease it was possible to determine which race was present. It was found that at least two races are widespread in the Pittsville area. Selection Md.-U.S.D.A. 2159 was resistant in all soils tested although the degree of resistance was less in some than in others. (Project J-78-A)

Seed Treatment Tests to Improve Stand of Field Legumes and Grasses

Preliminary studies are being made on seed treatment tests of alfalfa, ladino clover and red clover using Arasan, Spergon, Phygon and Pangen. In general there was little or no increase in stand as a result of treatment. However all treatments increased the stand of Sudan grass. Brome grass also showed better emergence when treated with several materials.

Dairy Production

Additional Information Obtained on The Cause of and Treatment for Ketosis (Acetonemia)

Previous studies at the University of Maryland Agricultural Experiment Station showed that most cases of ketosis, or acetonemia, in dairy cattle will recover quickly and without relapse after a single injection of either corticotrophin (ACTH) or cortisone. During the past year a new cortisone-like substance, 11-oxyprogesterone, was also found to be effective in the treatment of cows with ketosis. Six cases treated with from 2 to 4 grams all exhibited good recovery. The 11-oxyprogesterone appeared to maintain its effectiveness after injection over a longer period of time than either cortisone or corticotrophin.

Additional studies were conducted with ACTH using gelatin and oil preparations. These preparations maintained their effectiveness for longer periods than aqueous preparations previously used, apparently due to the slower rate of absorption.

Both acetic acid and propionic acid, substances produced in the rumen of the cow, have been shown to be helpful in the treatment of ketosis. Studies are currently under way to determine the level of these substances in the rumen of normal and ketotic cows and to find meth-

ods by which their production by rumen microorganisms may be influenced. The relatively low content of propionic acid and other volatile acids in the rumens of cows with ketosis was duplicated by fasting. (*Project G-37*)

New Form of Calcium Found Effective in Treatment of Milk Fever

Milk sugar, or lactose, can be converted to an acid and combined with calcium to form calcium lactobionate, a highly soluble form of calcium. Studies during the past year on 30 cows with milk fever demonstrated that this substance is fully as effective as calcium gluconate in the treatment of milk fever. It has about the same toxicity and maintains blood calcium at about the same levels following injection. Milk sugar, a by-product of the dairy industry, may find increased sales in the form of calcium lactobionate. Another by-product of lactose, lactic acid, when combined with calcium to form calcium lactate was found to be too toxic to be used for intravenous injections. (*Project G-37*)

New Hormone Preparation Stimulates Milk Production in Tests

A highly purified preparation of a hormone from the pituitary gland (Armour growth) increased the milk production of six cows in late lacta-



Farmers view alfalfa variety test plots at the Plant Research Farm.



Ladino-grass combinations are compared with and without the addition of nitrogen fertilizer. The aim of these tests and of the forage variety studies such as the one shown above is to produce economical high quality hay and pasture for the beef and dairy cattle of the state.



These tobacco plots at the Tobacco Research Farm are part of tests comparing low and high rates of fertilization.



The tobacco spearing machine developed by agricultural engineering researchers is being tested under field conditions.



A strain of chicken being developed by Experiment Station poultry scientists lacks the primary feathers needed for flight.



This promising new sweet potato selection, recently named Shoreland, was developed by horticulturists at the Maryland Experiment Station.



Agricultural engineers of the Experiment Station staff are developing this machine to speed tomato harvesting.



Chippendale, a new tomato variety developed at Maryland, is resistant to cracking and has a uniform color.



Left, udder of cow in late lactation before treatment with growth hormone. Right, same udder after 18 days of treatment. In both photographs, udder had just been milked out.

tion by 50 per cent. The production of two cows in mid-lactation was increased by over 100 per cent. Following the daily injection of 100 mg. of Armour growth hormone for ten days the udders of cows in mid-lactation almost doubled in size and remained rather large and firm following milking.

Daily growth hormone injections were made for a ten day period during which the blood glucose increased approximately ten per cent. Blood neutral fat decreased initially and then increased, and blood cholesterol esters decreased. Blood chemistry data did not reveal any definite clues as to the mode of action of growth hormone in increasing milk production. (*Project G-38*)

Additional Information Uncovered Concerning Fat Requirements in the Dairy Ration

Feeding experiments during the last two years have demonstrated that high fat rations would increase the butterfat test and total butterfat production for about two weeks. This work was continued during the past year to determine if the increase could be maintained over a period of time. Eighteen cows were divided into three groups of 6 each and fed three different levels of fat intake during the entire lactation period. These levels of 0.060 and 0.085 and 0.120 pounds of fat per 100 pounds of body weight were equivalent to grain mixtures containing 2.84, 5.34, and 7.71 per cent fat, respectively.

The higher levels of fat intake increased milk and milk fat production for a short period; however, the increased production of both milk and milk fat did not continue beyond two to three weeks after the cows had been placed on the higher fat rations and remained at this level through the rest of the lactation period. (*Project G-38*)

Tests Show Rumen Bacteria Responsible For Many Chemical Reactions

Fifteen carbon compounds known to be involved in carbohydrate and fat metabolism and twenty-four nitrogen-containing substances have been tested during the past year with mixed suspensions of bovine rumen bacteria under anaerobic conditions. Standard small metabolism apparatus and technique for measuring the substances produced were used.

Volatile acids, keto acids, lactic acid, carbon dioxide evolution, ammonia production and polysaccharide synthesis determinations were made.

Cellobiose, one of the first products formed from the woody portion of plants and glucose, but not maltose, was attacked with carbon dioxide as the sole gaseous end-product. Acetate, propionate, butyrate and hydroxybutyrate, all of which are produced in the rumen of the cow by bacteria were not altered appreciably by rumen bacteria in these laboratory tests, showing that these substances are used by the animal body as such without further breakdown. Formate was decomposed to hydrogen and carbon dioxide.

When carbohydrates were added to the preparation of rumen bacteria, a mixture of acetic, propionic and higher fatty acids were produced.



Dairy scientists using chromatographic columns for the determination of rumen volatile acids.



This radiation counter is used to trace the path of various substances from the blood into the milk of live cows and of the artificial cow used in this work. Radioactive tracer elements are used.

Acetic acid was the chief end-product except when succinate and maltose were used. With these, the chief product was propionic acid. Fatty acids, if metabolized, yielded only acetic acid. Carbohydrate substrates yielded a starch-like polysaccharide after twenty-four hours incubation with rumen bacteria.

Of twenty-four naturally-occurring amino acids and urea, the following were broken down by rumen bacteria; aspartic acid, glutamic acid, serine, cysteine, cystine, arginine, urea, and to a lesser degree, threonine. In no instance were keto or lactic acids detected, and with the exception of arginine, ammonia production was observed to be mole per mole. In all instances volatile fatty acids were found.

Rumen fluid was found to be es-

sential for the normal growth of rumen bacteria. The unknown factor or factors in the rumen fluid required for rumen bacteria were extracted with activated absorbing agents and eluted with alcoholic extracts. The unknown factors were found to be relatively stable to acid and alkaline hydrolysis. It is expected that these studies may lead to better methods of establishing the value of various feeds and pave the way for an understanding of how to feed the rumen bacteria and thus do a better job of feeding the cow.

Use Of Radioactive Tracer Substance Shows Beta-Hydroxybutyric Acid Is Converted Into Milk Fat

Using the artificial heart-lung perfusion apparatus described in the 64th Annual Experiment Station Re-

port, beta-hydroxybutyric acid containing radioactive carbon was added to blood and pumped through an udder removed from a cow immediately after slaughter. The radioactive carbon acted as a tracer. Beta-hydroxybutyric acid was found to be synthesized into milk fat and possibly other milk substances. This acid is present in the blood of normal cattle in moderate amounts and is present in the blood of cows with ketosis in relatively small amounts. It was also demonstrated that when acetic acid is present in the blood in large amounts, the udder uses it in preference to beta-hydroxybutyric acid.

The perfusion of a number of udders during the year has established two important factors in regard to the perfusion technique. First, it was found that all of the milk could not be removed by one milking prior to perfusion even with the aid of the "let down" hormone, oxytocin. Therefore, it is necessary to milk out the udder at two-hour intervals with the acid of oxytocin over a period of six to eight hours prior to perfusion to remove all of the residual milk. The second observation is that the amount of milk secreted by the perfused udder during a three-hour perfusion is relatively small, i.e., 10 to 30 ml. However, the small amount involved is sufficient for studies of the formation of various milk constituents in the udder when radioactive tracer substances are used. (Project G-43)

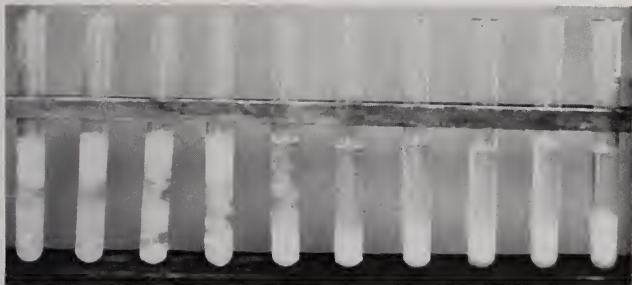
Further Studies On The Chromogen Method For Measuring Digestibility

Work was continued during the year to determine whether any specific chromogen (colored pigment) may serve as a satisfactory indicator in the determination of the digestibility of various feeds. Pigments were extracted from alfalfa hay and from the feces following the feeding of this hay to cows on digestion trials. All pigments were separated on an absorption column and their absorption curves determined on the spectrophotometer. Quantitative comparisons of over twenty-five single pigments indicated that either degradation or absorption occurred during the digestion process. No single pigment was found which could be utilized as a digestion trial marker. Under controlled conditions, the total pigments present offered the best possibility for marker studies and may be used in establishing more rapid methods for determining the digestibility of feeds. (Project G-39)

Dairy Technology

Chemical Changes In Milk Fat Related To Flavor In Dairy Products

The dairy industry is confronted with flavor problems due to the oxidative deterioration of milk fat during processing and storage of dairy products. Experiments leading to the identification of the flavor compounds found in oxidized milk fat have been continued. Research has



As adulteration of milk fat with vegetable fat is increased, fewer and fewer crystals will float in an alcohol solvent. Tubes (left to right) contain 1, 2, 3, 4, 5, 10, 20, 30, 50; and 100 per cent hydrogenated vegetable fat.

been started on the synthesis of various chemical compounds in the laboratory. The objective here is to try and confirm, with pure synthetic compounds, the previous indications that beta-unsaturated carbonyl compounds are responsible for the characteristic oxidized flavor in dairy products.

The role of copper as a catalyst in the development of oxidized flavor has been studied. Many workers have believed in the past that cupric ion was the active catalyst. The addition of a copper binding agent to milk was not effective in preventing copper induced oxidized flavor. This indicates that ionic copper is not necessarily the active catalyst. (*Project G-34*)

Methods Developed For Detecting Milk Fat Adulteration

The substitution of vegetable fats and animal body fats for milk fat in dairy products has become more prevalent in recent years. The con-

trol of this practice by the dairy industry and regulatory officials is dependent upon simple and reliable methods for detecting milk fat adulteration. Two such methods have been developed by dairy researchers at the University of Maryland during the past year.

One method is a rapid screening test in which suspicious samples are found by the behavior of the fat when it is crystallized from an alcohol solvent. Milk fat crystals have the ability to hold small air bubbles making them buoyant enough to float in the solvent. When milk fat is adulterated with non-milk fat, the crystals do not hold air and sink in the solvent.

A second method for detecting milk fat adulteration is based upon a chromatographic separation of butyric acid from the fat. Milk fat is the only natural fat which contains butyric acid. The butyric acid content of milk fat has been found to

be constant enough to permit the detection of as little as 10 per cent non-milk fat. The butyric acid content of an adulterated fat is lower than normal in proportion to the amount of adulteration. (*Project G-35*)

New Processing Procedures And Products Affect The Properties Of Ice Cream

High-temperature, short-time pasteurization of ice cream mix has recently been employed extensively in the ice cream industry. This change in processing has made it necessary to design new stabilizers to produce a smooth, palatable finished product with this method.

Findings indicate that important requirements of a stabilizer for adaptation to high-temperature, short-time pasteurization of ice cream mix are: (1) it should mix quickly and easily with dairy ingredients; (2) it should produce a thin mix that processes and cools well; (3) it should be stable to heat treatments; and (4) it

should give desirable body and texture characteristics to the finished ice cream.

New commercial products are being tried as constituents of ice cream mix. Early results indicate that products such as sodium caseinate, delactosed products, and modified milk protein products can be used advantageously. (*Project G-42*)

Brown Colored Material In Heated Milk Studied

The attempt to isolate and purify the brown colored substances formed in milk processed at high temperatures (200-300°F.) has been continued. The brown chromogens are soluble in water and insoluble in non-polar solvents. Most of the colored material is non-dialyzable. The brown colored material from heated milk has been concentrated to a tan powder which becomes very dark brown in the presence of water. The material contains nitrogen and work is planned on its analysis to obtain information as to its chemical structure. (*Project G-40*)

Entomology



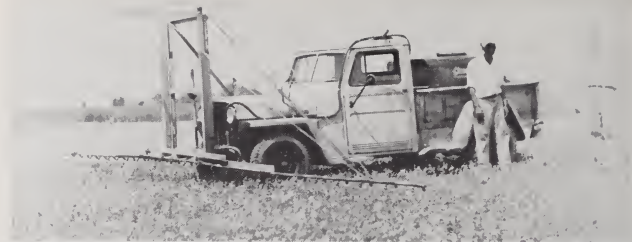
Experimental work at Maryland resulted in the adaptation of a broadcast pea boom to a high clearance corn sprayer. The machine has been successful in commercial operation.

The Department of Entomology attempts to reduce crop and animal losses through continuous research on the biology and the control of the pests that annually take a serious toll from Maryland agriculture. Since insect damage is often the difference between success and failure in crop and animal production, the emphasis in research in entomology is frequently dictated by the immediate needs of farmers. With so many new insecticides being offered, testing is necessary before efficient and safe procedures can be offered to the farmers. Pests new to the State demand the attention of the entomologist at frequent intervals and in consequence there is a running series of biological studies in progress as a Basis for efficient timing of insecticidal treatments.

Proper Timing of Treatment Necessary for Corn Earworm Control

Results of two years of experiments indicate that the timing and number of sprays necessary to control the corn earworm vary with the seasonal abundance of the pest. With comparatively light infestations first sprays may be delayed until more than 25 per cent of the ears are in silk. When heavy infestations occur in late season, applications of insecticide must be made earlier and more than two treatments are necessary. Early or late, four to five days between treatments gave best results.

The corn earworm is the most important of all crop pests in the United States and is one of the most difficult problems facing the economic entomologist. Though excellent



This commercial low-volume sprayer was designed for the treatment of canning peas. The broadcast boom is built to give maximum coverage.

results have been obtained with DDT, high oil emulsion sprays are costly and too many treatments are needed when heavy populations of earworm occur.

The objective of this work is increasing the effectiveness of spray treatment so that the number of applications and cost may be reduced. The corn earworm sprays are also effective against the European corn borer and the fall armyworm. (*Project H-29-j*)

Increased Yields of Pickles Possible With Insecticides and Fungicides

Early applications of insecticides to pickling cucumbers are often necessary to insure a stand of plants, according to results of tests with sprays. Cucurbit wilt also can be eliminated if insects are controlled, the results indicate. From results obtained in 1953, insecticide treatments do not appear necessary after the plants begin to bloom unless the melon aphid appears. The

reverse condition appears to be true for fungicides. They are of little value in early sprays but may be necessary after plants begin to bear to keep down disease and prolong the pickling. Returns from the insecticide and fungicide program apparently will vary greatly from season to season depending on insect abundance and the occurrence of cucurbit diseases.

This work is being continued in hope of obtaining the most practical answer to this problem. (*Project H-20-i*)

Pea Aphid Control Research Completed

Continuous active research on the pea aphid was begun in 1937 on the Eastern Shore of Maryland and has resulted in highly satisfactory methods by which canners may control this insect. Early work centered around the rotenone insecticides which came into prominence as a pea aphicide, replacing nicotine, at the beginning of this period. About

1945, because of its superior performance, DDT replaced rotenone. This material, in turn, has been replaced by the organic phosphorus insecticides.

Of the organic phosphorus materials, Malathion has outstanding merit for pea aphid control. It is highly effective against the aphid, it is the least dangerous of the phosphorus-containing insecticides from the standpoint of operation hazards, and it leaves no residue on vines or seed if applied 10 days to two weeks before harvest. It has only two minor disadvantages. Its high effectiveness is reduced by heavy rains if they occur immediately after application. Residues are washed from the plant and some hydrolysis occurs. How-

ever, even during the wet spring of 1953 only a very small commercial acreage had to be treated again. When heavy dosages were applied in hot sunny weather with temperatures around 90 degrees, some chlorosis of the plant resulted. This condition was most pronounced three days after treatment. In 7 to 10 days the condition was no longer apparent and affected fields gave yields approaching two tons per acre of extra standard peas.

As a result of this work recommendations for pea aphid control are specific: one and a half pints of 50 per cent emulsifiable malathion *per acre* reduced to one pint in hot weather, applied with a ground sprayer in 25 gallons of water or, if



The pea sprayer in action applying 25 gallons of spray per acre at 150 pounds pressure. With a field speed of 7 m.p.h., this sprayer can cover 100 acres or more in a single day.

weather conditions are favorable, with an airplane at the rate of two pints of the above emulsion in three to five gallons of water per acre. The ground sprayer is to be equipped with a broadcast boom as designed for pea treatment. Weed sprayers are not recommended. In commercial applications where these recommendations have been followed and weather conditions were favorable, complete kills of aphids have been obtained. Seventy-five per cent or better kill can be expected within 24 hours; in three days, kills should exceed 95 per cent. Under favorable conditions few if any aphids should be present after 10 days. On experimental plots at College Park higher yields of peas have resulted from malathion treatments than treatments with any other insecticide. (*Project H-29-h*)

Two Insecticides Effective in the Home Garden Aerosol

A combination of 2 per cent Dilan and lindane is so far the best formulation found for general effectiveness against vegetable insects. Lindane, however, may impart an off flavor to some crops, particularly potatoes when frequent treatments are made near harvest time. No off flavors from this material occur in melons, cucumbers, cabbage or other leafy crops that are eaten uncooked. In single insecticide formulation, malathion has given good general results but cannot be used too frequently on cucurbits as it retards plant development.

Aside from the objective of de-

veloping a general formulation, considerable information has been obtained on the performance of the different insecticides used. This information is of considerable interest to the entomologists since the methyl chloride propellant and the methylene chloride solvent used in the aerosol are both highly volatile and are dispersed in the air soon after application, leaving only the insecticidal residues on the plant. Since only technically pure insecticides are used in aerosols, plant damage and toxicity to insects can be attributed directly to the chemical used. (*Project H-46-c*)

Yield Increases Secured by Spraying Beans

In experiments at College Park, two newer insecticides, malathion and Dilan, have been found to be highly effective against the Mexican bean beetle. Complete control of this insect has been obtained with 2 pints of 50 per cent emulsifiable malathion or 25 per cent Dilan emulsion per acre in low volume sprays. Yield increases on both snap and lima beans have resulted, especially where Dilan was used and Mexican bean beetles were not present. These higher yields appear to be associated with better flavor and higher quality, particularly of snap beans. Both of these insecticides are effective against other insect pests of beans: leafhoppers, the spotted cucumber beetle, thrips and the black bean aphid.

Work on this project is being emphasized to obtain more information of the effect of control of the various



This experimental row-crop sprayer was designed particularly for the treatment of beans. The Slosser type boom in cultivator position lets the operator observe the spray application without interfering with his driving.

insects, on yields, the minimum number of insecticide treatments necessary and the timing of treatments in relation to the seasonal activity of the insects involved. (*Project H-29-g*)

Insecticides in Concentrated Sprays are Highly Effective

In many experiments on lima beans, peas, and cole crops better insect control has been obtained with constant dosages of insecticides in 20 to 40 gallons of water than when applied in 100 to 150 gallons of water per acre. Concentrated solutions are more effective against insects and a higher percentage of the chemical is deposited on the plants since there is little or no runoff when low volumes of water are used.

In cooperation with the Botany and Horticulture Departments, ef-

forts are also being made to determine the minimum amounts of water necessary to apply fungicides and plant nutrients. Potatoes, tomatoes and cucurbits are being used in this work. Results to date indicate that the amount of water may be greatly reduced from the 150 gallons generally recommended but the practical minimum has not yet been determined.

The Agricultural Engineering Department is assisting in this problem and equipment for applying low volume sprays is being designed, built and tested in the field. Equipment developed for the application of insecticide to broadcast crops, particularly, has proven satisfactory on an experimental basis, and several units have given desired performance on commercial acreage by growers.

The so called "Slosser" row crop boom is being adapted to low volume sprayers for use on beans. Tractor mounted equipment of this type which has been used in experimental work has proven to be especially desirable on commercial acreages. The equipment is easy to handle and excellent plant coverage is obtained.

This is considered a most important project from the practical viewpoint and work on it will be emphasized next year. With concentrated sprays, the cost of insecticidal treatments are reduced, efficiency is increased and the spray operation is greatly speeded up. (*Project H-16-d*)

New Insecticides Effective for Japanese Beetle Control

Excessive damage from Japanese beetle, spray residue problems, and the toxicity of various insecticides to humans have stimulated public demand for an evaluation of practically every new insecticide with respect to its toxicity for the control of the Japanese beetle.

During the past year evaluation studies were made on the relative efficiency of several of the newer insecticides; Dilan, malathion, Metacide, EPN and NPD. Two plant systemics, Systox and Octomethyl pyrophosphoramidate, designed to make the plant itself poisonous to the beetles, were also tested.

All of the insecticides under test, with the exception of the two systemics, were effective for killing the Japanese beetle when used at the proper dosage level and were appar-

ently safe on most foliage. The systemics, when employed as such, did not appear to have value in killing beetles feeding on foliage.

Dilan was found to be highly effective. It gave a very fast knockdown and left residual deposits that lasted up until seven days in some instances. In field spraying complete kills were obtained at dilutions of one part of a 25 per cent emulsion in 600 parts of water.

Malathion also gave outstanding performance. One hundred per cent kills were obtained in sprays containing from 1 to 3 pounds of the actual chemical in 100 gallons of water.

EPN 300 and NPD were efficient for killing the beetle at dosage levels of 2 to 3 pounds of the actual chemical in 100 gallons of water.

The insecticide Metacide, which consists of parathion and its dimethyl homologue, gave a quick knockdown and a 100 per cent kill at a dosage of 0.12 pounds of actual chemical in 100 gallons of water, but as with other phosphorous base insecticides, the residue was not effective for killing large numbers of the beetles after two days. (*Project H-11*)

Corn Planting Time Influences Corn Borer Infestation

The amount of damage from the European corn borer often varies considerably from field to field in the same community. Studies on the biological and seasonal development of the insect, coordinated with the development of corn, show that the time farmers plant corn may

determine the amount of damage in a given field. Also the time farmers, as a whole, plant corn may determine the degree of damage in the community. Any combination of factors which permit or encourage early planting of corn increases corn borer damage. Planting corn in April and early May contributes to heavy corn borer outbreaks. Available records indicate that if the planting date for all corn in a community could be delayed until after May 15th the corn borer would have difficulty in maintaining a high level of infestation.

Coordinated data show that the pattern of infestation, as well as the amount of damage from corn borer, is largely the result of the relationship between planting dates and corn development. This is particularly true for sweet corn. Very early and very late corn is always much more heavily infested than mid-season corn. The total borer population in very early and very late corn often averages 4 to 5 times greater than in mid-season corn.

Normally relatively few moths from overwintering larvae are available to lay eggs on corn planted after May 10. In 1952 over 75 per cent of the moths from overwintering borers emerged before corn planted April 20 to May 10 was big enough to be attractive for egg laying or satisfactory borer establishment. But in spite of this condition early planted corn was quite heavily infested, the infestation coming from the late emerging moths.

Since only a small proportion of

corn in Maryland is planted in April and early May, very early corn is normally quite heavily infested. But since the amount of early corn is limited there is a scarcity of moths in the community, as a whole, to lay eggs for the second generation. There is always an abundance of corn to receive eggs from a relatively few second generation moths. Thus the necessity for concentrated egg laying by emerging second brood moths is eliminated. This spreads a comparatively few eggs over the bulk of the corn crop, and as a result damage to mid-season corn is low. There is always a rapid build-up in corn borer populations from late second and third generation moths. Late corn is most attractive for receiving these eggs. This results in late planted corn being heavily infested. (*Project H-43*)

Tests Continue on Parasites as Means of Corn Borer Control

European corn borer parasite liberations were continued in restricted areas of the State, particularly Allegany and Garrett Counties where the corn borer has only recently become established. A few colonies of *Macrocentrus gifuensis* were released on the Eastern Shore where this species has not been successfully colonized.

The corn borer parasite populations continue to increase in the central part of the State. Most of this increase is due to *Macrocentrus gifuensis*. The high parasite population is reflected in the relatively low corn borer population.

The situation on the Eastern

Shore is less encouraging where only the fly *Lydella stabulans grisescens* has been successfully colonized. During the past three years there has been a decline in *Lydella* populations and a corresponding increase in corn borer populations. During the three year period, the parasitism of overwintering borers has declined from a high 30 to 60 per cent to 5 to 15 per cent in the lower counties. (Project H-43)

Methods of Controlling Sap Beetles Studied

Because of the increasing importance of sap beetles as a sweet corn pest and because it was found to be very closely associated with corn infested with the European corn borer and the Japanese beetle, some studies on this insect were made in connection with the European corn borer and Japanese beetle projects.

Within recent years sap beetles have caused concern among sweet corn growers in Maryland. On occasion they have infested all of the ears in a sweet corn field just before and at the time of harvest. Adult beetles are frequently encountered in numbers in corn ears beneath the husks. Developing larvae are frequently found in the same areas as the adults. Often the larvae feed deeply between the rows of the kernels and a few actually within the kernels. Such conditions of infestation reduce the value of sweet corn when it is placed on the market and places an extra burden on canners in culling operations before processing.

General observations indicated that the sap beetle was most damaging in corn that had been previously injured by the Japanese beetle, European corn borer or some other insect. Evidence showed that, on occasion, sap beetles do infest corn not injured by other insects, but the data do not give clear cut information of how often this may occur. Field observations indicated that DDT had some value, but laboratory tests showed Aldrin, Toxaphene, Lindane, EPN, Parathion, and Metacide were more effective for killing sap beetles than DDT. (Project H-43)

The Control of Orchid Pests

Work was completed and published on the mite *Brevipalpus australis*, a serious pest of Dendrobiums, Calanthes and Epidendrums.

The biology and control of a new Eriophyid mite was completed and a control worked out. This pest causes dark brown areas on pseudobulbs and black sheaths of young Cattleyas.

The control of the Florida red scale on Coelogyne, the Lantana aphid on Epidendrums and an undetermined mealy bug on Phaius was worked out in the United States Botanical Gardens greenhouses. An emulsion of DDT as developed by this Department was successful in the control of these pests.

Work is in progress on the transmission by Boisduvals' scale of color break in Cattleya. (Project H-21)



The Chesapeake tomato, introduced in 1953, resulted from the vegetable breeding program.

Horticulture

Tomato Breeding Program Results in New Variety, Chesapeake

The Chesapeake tomato variety was released for seed increase in the spring of 1953. The new tomato was developed from a 3-way cross involving Brown's Special, Marglobe and Pan America. Chesapeake has been tested over an extended period and has been found adapted to Maryland and Delaware and the southern parts of Pennsylvania. Fruiting is normally 3 to 10 days later than Rutgers and it produces heavily until frost. The fruit is slightly larger than Rutgers, is equal to or slightly better in color, is firmer, and has a higher solids content than Rutgers. Chesapeake has the uniform unripe color and develops an even red color. The variety is recommended for processing and for the late market in those areas near the Chesapeake Bay and its tributaries.

Particular advantages of Ches-

apeake are its high degree of resistance to fruit cracking and a high degree of resistance to Fusarium wilt. Plants are generally very stocky, and yields of marketable fruit have usually exceeded other varieties by about 20 per cent. (Project Q-82)

Two New Varieties of Sweet Potatoes Released for Maryland

As a result of three years of testing and increase, two varieties of sweet potatoes were released for Maryland in the spring of 1953. The Sunnyside variety was released by the U. S. Department of Agriculture, Bureau of Plant Industry, Division of Vegetable Crops, in cooperation with the Maryland Agricultural Experiment Station.

Sunnyside roots are of the soft-fleshed or "moist" type. They have tan skin and salmon to orange flesh, are short tapered in shape, relatively smooth, and generally of medium size. The variety has a high degree

of resistance to cracking as demonstrated in the testing program. Yields have been medium to heavy. The variety is well suited to processing, being very attractive, firm, and of satisfactory quality either in vacuum pack or canned in syrup.

Oklahoma 46 was also released to Maryland and other states where the "Jersey-type" sweet potato is grown. Particular advantages of the variety are resistance to root cracking, resistance to the root-knot nematode, and some tolerance to soil rot. Yields have ranked high, and the internal color is very deep orange.

Moderate supplies of seed of both the Sunnyside and the Oklahoma 46 should be available commercially for 1954 planting. (*Project Q-74*)

New Vegetable Varieties Tested for Maryland Use

Plant breeders throughout the nation release many new varieties of vegetables each year. The testing of these new varieties is an important phase of the horticultural research program. Also, by testing

promising lines from plant breeders through cooperative programs it is often possible to know if a new variety is adapted locally before it is released to the public.

Cantaloupes: Six varieties of cantaloupes were tested at the Vegetable Research Farm near Salisbury. Using percentage of soluble solids as a measure of quality, the Hearts of Gold and Purdue 44 melons were best in the early planting, and Pride of Wisconsin and Queen of Colorado were best in plantings made after June 1. Purdue 44 was considered to be slightly small for general commercial use.

Snap Beans: Seven varieties of snap beans were tested in Baltimore County. Topcrop, B-2254, and Contender were the highest yielders. B-2254 and Tenderlong 15 were the highest in quality after being processed. Testing of the B-2254 strain will be continued and expanded.

Southern Peas: Of eighteen varieties tested at College Park, Dixie Lee, Extra Early Blackeye and Pur-



Two new varieties of sweet potatoes showed exceptional promise in Eastern Shore tests and have been made available for commercial production.



Growers examining the results of sweet potato trials at the Vegetable Research Farm, Salisbury.

ple Hull 49 were considered to be most adapted to Maryland. These three varieties yielded over 1400 lbs. /A. of shelled peas from the first two harvests, simulating the yield obtainable from a commercial viner harvest.

Broccoli: Early, medium, and late types of broccoli have been under test for two years at Salisbury. Several varieties appear to be well adapted to the Eastern Shore of Maryland. For the production of center heads the Green Sprouting Early Green, Green Sprouting Early and Freezers Medium were highest in yield.

Early One, Waltham No. 29, Early Calabrese and Early Green Sprouting gave the highest yield of side shoots. (*Project Q-74*)

Spraying Nutrients on Tomatoes Valued at Fifty Dollars per Acre, Net

Three years of testing at the Vegetable Research Farm have shown that the yields of tomatoes

and the grade of the tomatoes produced may be markedly increased by the foliar application of fertilizer materials. The term "foliar spraying" is used to denote the placement of fertilizer materials upon the foliage in a very dilute spray. Plants are able to utilize certain of the nutrient elements directly through the leaves. Most spectacular among the responses has been the increased yield and quality of tomatoes from the use of 4 pounds per acre magnesium sulfate and 2 pounds per acre borax, incorporated with the standard fungicide and applied in the usual spray applications. Cost analysis has shown an increased net return of \$50 per acre from this use of magnesium sulfate and borax in the spray schedule. Responses have been greater when incorporated with the ziram-fixed copper schedule or with the zineb schedule than when used with the manganese

ethylenebisdithiocarbamate fungicide. (*Project Q-79c*)

Storage Conditions for Hydrangeas Have Pronounced Effect on Growth and Flowering

There is a wide variation in fall storage of hydrangeas used by commercial florists. Some plants are stored in cold frames or unheated greenhouses in the light, whereas others are stored in buildings or cellars in the dark. A study of the effect of storage temperatures and of the absence or presence of light during storage on subsequent forcing has been made. It was found that the plants defoliated by the end of 4 weeks under all storage conditions, although defoliation was most rapid on plants stored in the dark. Storage under light or dark had no influence on growth nor number of days required for forcing. Storage temperature and duration of storage had the most influence on growth during forcing. A storage temperature of 40°F was most effective in termination of dormancy and stimulation of plant growth. At temperatures of 47°F and 55°F, a longer period of storage was necessary to obtain the same growth response.

Other studies have shown that the application of nitrogenous fertilizer to the hydrangea just prior to storage decreased the number of days required for forcing. The application was more effective with plants placed into storage in October than with plants stored in November. This nitrogen treat-

ment probably affected the growth following dormancy rather than having an influence on breaking the rest period. The addition of nitrogen immediately before storage would be most advantageous when plants are stored early and when the plants are intended for flowering early in the spring season. If there is sufficient time to give the plants 45 days of storage at 40°F, this nitrogen application is unnecessary.

The work has indicated that there is a varietal difference in the response of hydrangeas to environmental conditions during storage. (*Project 174A*)

Azalea Fertilization Influences the Production and Survival of Cuttings

The nutrition of the plant from which cuttings are taken influences the number of cuttings produced, their ability to form roots, and their survival, research shows. In tests, three varieties of evergreen azaleas, Hexe, Vervaeneana, and Gardenna Supreme, were grown in peat and in quartz sand in the greenhouse. They received nutrient solutions which varied in concentration of nitrogen, phosphorus, and potassium.

As previous studies have shown, nitrogen had the greatest influence on growth and on flowering. A high nitrogen application results in a greater amount of vegetative growth that is suitable for cuttings. Cuttings of mature wood, taken from the high nitrogen plants, gave

the greatest percentage of rooting and survival. However, if soft or succulent cuttings were used, best rooting and survival of cuttings was obtained from the plants receiving the low level of nitrogen. Variations in the phosphorus and potassium nutrition had no important influence on the production or rooting of cuttings.

Propagators of the azaleas will find it advantageous to maintain well fertilized plants for propagation purposes. Such "stock" plants should be given complete fertilizers of high nitrogen content. (*Project 26A*)

Chemical Soil Conditioners Tested for Greenhouse Use

The use of the new synthetic soil conditioners for greenhouse and other ornamental crops has many possibilities since manure, peat, or other organic materials may be expensive or hard to obtain in large amounts. The relatively high cost is not as much a drawback for an intensive type of culture as it is for field use.

The material known as "Krilium" has been used for potted plants, such as azaleas, hydrangeas, cyclamen, poinsettias and several annual flowers. Beneficial results from preliminary experiments were noted only with poinsettias. The material was most effective when used with a soil mixture containing peat.

Roses represent a long term crop in greenhouse as the plants are commonly grown for a period of 4 or 5 years. Different amounts of

the liquid and dry forms of the material known as "Aerotil" have been used in rose soils both with field soil and with a mixture of field soil and manure. An experiment with roses is being conducted where both "Aerotil" and "Krilium" have been used with soil, soil and peat, and soil and manure mixtures using different methods of watering. Production records have indicated some benefit from the treatment, but it is too soon to show conclusive results from this experiment.

An experiment to study the effects of the usual steam sterilization of greenhouse soils in relation to the stability of chemical soil conditioners is underway. A rotation of chrysanthemums and snapdragons planted in sterilized and unsterilized soils with added applications of "Aerotil" is the basis for the test. At present there has been no observable effect of sterilization on the action of the soil conditioners. There have been no differences in flower production from the several treatments, but the plots treated with the soil conditioner have maintained a better physical condition, particularly with reference to percolation of water. (*Project 1-74*)

Search Underway for Objective Measurement of Flavor

Considerable success has been obtained in developing objective, that is, physical and/or chemical methods, for measuring characteristics of quality such as color or texture

Rapid, practical methods for measuring the flavor or degree of off-flavor of foods, however, have not been developed as yet. In fact, it has been suggested that since flavor is a physiological sensation, it is by definition subjective, and therefore not subject to objective measurement. Since the factor of flavor is obviously a most important factor of quality of foods, and since no practical objective method is available, a statistical approach has been undertaken through the use of a taste testing panel, where trained tasters score foods for flavor quality, and these scores are analysed statistically for differences.

The triangular test procedure has been adopted by many laboratories. This consists of presenting each taster with three samples, of which two are identical and the third is different. If enough tasters can identify the odd sample enough times, it is concluded that a real difference exists in the flavor of the two samples compared. Obviously such a method is cumbersome and time consuming. Work is underway at the University of Maryland to develop more efficient taste panel procedures. One such procedure is called the "multiple comparison" test. It provides more information with but one fourth the effort required for the triangular test, especially for products containing discreet units such as canned or frozen fruits and vegetables. With homogeneous products such as juices, the advantages of the mul-

tiple comparison test are also present though not to the same degree.

This procedure has been applied to the evaluation of flavor differences arising from the use of new varieties, and application of insecticides and fungicides that might cause off flavors in processed fruits and vegetables. (*Project Q58M*)

Formula Developed for Predicting Color Loss in Tomato Products

Color is the most important single factor of quality in tomato products. With the recent development of high temperature and tubular sterilization methods, the processor has the opportunity to select from a wide array of heat sterilization procedures the one most satisfactory for his purpose. Since maximum color retention is extremely important, the processor should have at his disposal some means of predicting just how a given procedure will affect the color of the finished product.

With the aid of specially devised test cells, some 300 heating-cooling curves were obtained, where tomato juice was heated and cooled at various temperatures and for various periods of time. When the results were calculated statistically, it was found that the overall effect of application of heat on color loss could be described by the following single equation:

$$\text{color loss} = \log \frac{T_s}{525} \frac{(RT - 120)}{40}$$

where color loss is expressed in terms of units of the U. S. grading



The effects of time of planting and type of pruning on flower production of carnations are studied in the greenhouse.

system as determined by the use of the Hunter color and color difference meter, T_s is the summation of degrees Fahrenheit above 140° times seconds at that temperature, and RT is the retort temperature. Temperatures below 140°F had no effect on color loss, and no other factors other than temperature were effective in accelerating or retarding the loss of color in tomato products during processing. (*Project Q581*)

Efficient Sampling Procedures Cut Cost of Grading Tomatoes

The major portion of vegetable crops such as tomatoes, sweet corn, beans, and peas, grown in Maryland are sold to processors for eventual marketing as processed products. These raw materials are commonly sold on a "Grade" basis. The price of the load offered for sale depends on the quality, as determined by a grader who inspects the load and assigns a grade to the load.

In grading raw tomatoes for processing, two to four hampers are

usually removed from a load, and the entire contents of perhaps 300 to 600 fruits are examined to determine the grade for the entire truckload of as many as 1,000 hampers.

This procedure has met with considerable criticism, largely because these two to four baskets do not constitute an adequate sample upon which to base the price of the entire load. Preliminary studies indicated that at least eight baskets, containing approximately 1,000 fruits, should be sampled in order to arrive at a grade which reflects the quality of the entire load with a minimum degree of satisfaction.

Since grading such a large number of fruits is impractical because of the high cost involved, a study was made to investigate the possibility of drawing an adequate sample from more than two to four baskets, but using only a fraction of the fruits in each basket for the actual grading.

Results indicated that the most

efficient sampling procedure is the removal of ten tomatoes from each basket, and the number of baskets to be handled depends on the precision that is desired. For example, it was found that a grade based on the inspection of only 80 tomatoes from eight baskets will be as precise as a grade based on 300 tomatoes taken from three baskets as is the current practice. If greater precision is required, a grade based on 240 tomatoes taken from 24 baskets will be as precise as a grade based on 1,000 tomatoes taken from eight baskets.

Similar studies are in progress for other commodities marketed in boxes, crates, or baskets, rather than in bulk. (*Project Q58f*)

New Chemical Eliminates Hand-Thinning of Apples

Elimination of the expensive but necessary hand-thinning operation by the fruit grower is the result of recent extensive experiments in chemical-spray thinning of apples.

Tests in the past year have shown that the new material naphthalene acetamide is the most promising chemical yet discovered for post-bloom spray thinning of summer varieties.

Concentrations of the acetamide ranging from 20 to 60 parts per million were applied to several summer and early fall varieties during the petal fall period up to 10 days after full bloom. Thinning varied from little to excellent in these experiments depending on concentrations used. As with naphthaleneacetic acid (NNA), applications of acetamide late in the 10 day range, resulted in more thinning than earlier applications. Generally, however, summer varieties of apples must be spray-thinned not later than late petal fall in order to avoid ripening effects from the thinning chemical as harvest approaches.

In experiments on fall and winter varieties in 1953, the amide form



New weed control chemicals have given good results in strawberry plantings. The four rows at the right were untreated. Tests are cooperative with the United States Department of Agriculture.

appeared to be too mild in action.

In several experiments both on the Eastern Shore and in Western Maryland, NNA gave proper thinning and overthinning depending on concentrations used, tree vigor, the amount of pollen available from other varieties, and the amount and severity of cold weather in the early spring. The sub-freezing temperatures which occurred in the Hancock area in 1953 immediately prior to apple bloom and the cold weather which accompanied and followed the bloom period resulted in the set of many apples containing a low seed count. Under these conditions a heavy drop took place in late May and chemical thinning was not warranted in many cases.

Twenty-five organic growth regulating compounds were screened in the spring of 1953 in an effort to find some chemical with which peaches may be spray-thinned after bloom. This work was carried on using hand sprayers and limiting the spraying to individual tagged limbs on each of several trees. Four compounds have given excellent thinning with no injurious effects on fruit or foliage. These tests will be extended next year to full orchard experiments using a pressure sprayer. (*Project L-74*)

Leaf Analysis Survey of Maryland Orchards Lays Groundwork for Fertilizer Recommendations

The value of leaf analysis for plant nutrient elements has been established as a diagnostic tool in determining the nutrient status of

the plant by research workers in Maryland and many other experimental stations. In the summer of 1952 a nutritional survey of the apple and peach orchards in Maryland was made by chemical analysis of leaf samples from 130 blocks of apples and 92 blocks of peaches, covering all the orchard sections of the State. The analysis included nitrogen, potassium, phosphorus, magnesium, calcium, and boron. The data obtained have been used to correlate vigor and productivity of the tree with levels of nutrient elements in the leaf and as a basis for fertilizer recommendations to growers.

Certain "critical" levels for plant nutrients in the apple leaf have been proposed. In the present survey about one-third of the orchards were below the proposed level for potassium, and about one-tenth below the proposed level for nitrogen or magnesium. The apparent vigor of the orchards was more closely associated with the nitrogen level in the leaf than with the content of other nutrient elements. Low levels of potassium were often associated with high nitrogen levels. It seems probable that the proposed "critical" levels for potassium (1.0 per cent for York, 1.5 per cent for other varieties) may be higher than required for satisfactory performance.

The peach orchards sampled also showed a high correlation between nitrogen concentration in the leaf and vigor of the tree. (*Project Q-79-b*)

Poultry

During the past year, the principal lines of poultry research pertained to improved methods of breeding, physiological problems involved in production and reproduction, and preparing better balanced diets for broilers, layers, and turkeys.

Experiments conducted at the Broiler Substation at Salisbury complement the more fundamental research carried on at the University at College Park and yield results that are of direct interest to broiler producers.



Electric battery brooders in the chick laboratory at College Park will accommodate about 190 groups like this.

Breeding

Flightless Strain of Broiler Chickens Developed

During the 1949 brooding season, a male New Hampshire chicken, completely lacking in primary and secondary flight feathers, was observed in the University stock. Since these large wing feathers are not essential to the welfare of the bird and since it requires special machinery and additional labor in broiler dressing operations to remove them, it was decided to investigate the possibility of developing a strain of chickens that would be flightless at market time.

The original male was mated with New Hampshire females of a broiler strain and the progeny of

these matings crossed among themselves and backcrossed to unrelated, normal New Hampshires. The early mating proved the condition to be hereditary, and in the 1953 hatching season some matings between flightless individuals produced all flightless offspring. In 1951 some of the flightless families were crossed with White Leghorn stock to introduce the dominant gene for white plumage color. In following generations, the white segregates were backcrossed with flightless New Hampshires to combine white color with desirable broiler characteristics. As yet the strain has not been entirely purified for either flightlessness or white color.

Up to the time of the first molt (6 to 8 weeks), the chicks from the flightless stock have normal-appearing primary and secondary flight feathers. At the first molt, these feathers fall out and do not regenerate. This loss does not appear to hinder the activity of the birds nor alter their appearance markedly. All other feathering, including that of the tail, appears to be normal. The flightless males have given very good fertility. Nests for the hens must be on or close to the floor, or else some type of ramp for the hens must be provided as they are unable to jump more than a foot or so.

The commercial possibilities for the strain have not been explored and no stock is ready for distribution. (*Project M-33-i*)

White Plymouth Rock and New Hampshire Strains Compared for Broiler Production

Research on differences in growth rate and feed efficiency in commer-

cial broiler strains was expanded to secure additional data on White Plymouth Rocks and New Hampshires, the two most desirable strains previously tested. In the second trial, 3 pens of 500 birds each of White Plymouth Rocks and of New Hampshires were grown under comparable conditions to 12 weeks of age at the Salisbury Substation. At 10 weeks of age, the average weight of the White Plymouth Rocks was 2.77 pounds with a feed conversion of 2.93, while the average weight of the New Hampshires was 2.91 with a feed conversion of 2.88. At 12 weeks of age, the White Plymouth Rocks had an average weight of 3.61 and feed conversion of 3.04, while the New Hampshires weighed 3.74 with a feed conversion of 3.05. It was concluded that the two strains were nearly comparable in growth rate and that feed conversion is primarily a function of growth rate



This lot of New Hampshire broilers at the Salisbury Substation averaged 3.4 pounds at 10 weeks and required only 2.54 pounds of feed per pound of liveweight. This house will accommodate eight pens of 500 broilers each.

The findings indicate that the White Plymouth Rocks, preferred by dressing plants because of their white pinfeathers, can successfully compete from a growth standpoint. (*Project M-33-k*)

Researchers Select Medium-sized Strain of Turkeys for Reproductive Ability

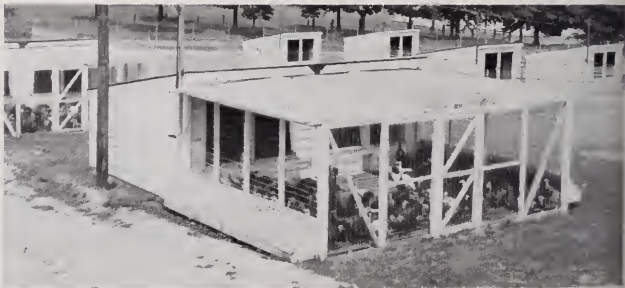
The poor reproductive rate of most strains of turkeys is one of the main factors causing high poult costs. Poor egg production combined with low fertility and low hatchability is too often the rule rather than the exception among turkey flocks.

Selection toward combining good reproductive ability with rapid growth and good conformation has been carried out at the University of Maryland during the past five years. The families selected for breeders in 1953 were all from dams that laid at the rate of 70 per cent or more during the ten-week trap-nest period and whose eggs hatched

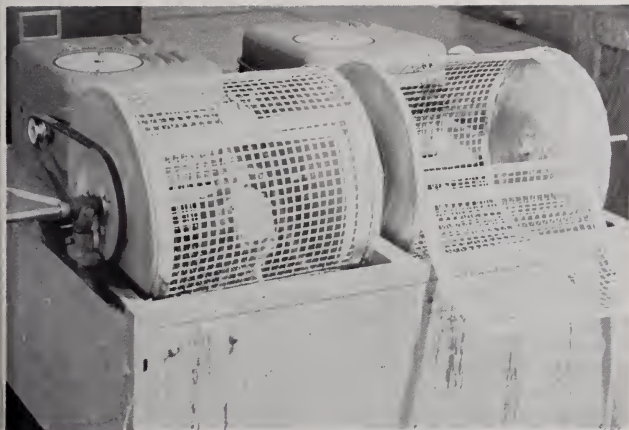


Single-tom trapnested mating of the medium-sized strain of turkeys.

at the rate of 70 per cent or more of all eggs set. During the 1953 hatching season, approximately 75 per cent of all eggs set hatched. During the season, approximately 3,000 poults were hatched, 1,000 of which are being reared. Further selection on a family basis will be carried out and will be based upon the reproductive ability of the parents, including freedom from broodiness, growth rate, and color. (*Project M-34-e*)



Turkeys are reared in confinement on slatted sunporches attached to the fronts of brooder houses. Smaller houses in rear are for turkey breeding stock.



These exercise cages are used to test the effect of various treatments on resistance to fatigue.

Hormonal Control of Economic Traits in Poultry Studied

During its lifetime a bird is subjected to many unfavorable environmental conditions, commonly referred to as stress. The stress may result from cold temperatures, hot temperatures, muscular fatigue, confinement, or many other unfavorable conditions, but the physiological response is controlled by the same mechanisms.

Muscular fatigue was the type of stress used since it lends itself to measurement. New Hampshire chicks 4 weeks of age were placed in cages that revolved and the time required to exhaust the birds under various conditions was determined. The effect of the level of thyroid

activity and the effects of male and female hormones on resistance to stress were studied. Thyroxin aided in the resistance to stress, but the adrenal is probably a more important factor influencing resistance. It was found that the pituitary gland is capable of secreting high levels of both thyrotropin and adrenocorticotropin simultaneously. The male sex hormone increases the ability of the chick to resist stress.

In another phase of work, the thyroidally-active material Protomone (5 gms. per cwt.) was fed to a pen of 500 White Plymouth Rocks and a pen of 500 New Hampshire broilers at the Substation. Controls under comparable conditions were maintained. At 10 weeks

of age, the treated White Plymouth Rocks averaged 2.86 pounds with a feed conversion of 2.86 compared with values of 2.77 pounds and 2.92 for the controls. The values for the treated New Hampshires were 2.88 pounds and 3.11 conversion and for the control New Hampshires 2.88 pounds and 2.86 conversion. Under these conditions, the treatment was beneficial to the White Plymouth Rocks and of no value for New Hampshires. (*Project M-33-h*)

Tests Show Differences in Thyroid Activity Related to Strain Differences in Poultry

Breed and strain differences are caused by a gene or genes, yet these hereditary factors must in turn alter some of the mechanisms that control body processes. The endocrine glands are one such mechanism. One of the more important of the endocrine glands is the thyroid and this gland was chosen for study.

Strains of birds have been developed which differ markedly in the response of their thyroid glands to thiouracil, a compound that causes thyroid enlargement. When fed thiouracil for the first four weeks of age, the thyroid glands of one strain were as much as 400 per cent larger than those in the other. In general, the two strains have been about equal in reproductive performance but have exhibited differences in resistance to Newcastle disease, indicating that there are strain differences in resistance to Newcastle disease and that these

differences may be associated with thyroid activity. (*Project M-32-k*)

Artificial Insemination Studied with Chickens and Turkeys

Artificial insemination of turkeys has received considerable interest within the last few years and when additional information about the storage of semen is available, it may be a useful technique for chickens. The information apparently most sorely needed concerns method of diluting and storing semen. The possibility of extending the usefulness of semen with antibiotics, hormones, and extenders was investigated. One of the most useful diluents found was whole milk to which either male or female hormone had been added. Terramycin increased the in vitro survival time of semen but appeared to be detrimental to the fertilizing capacity of semen held short periods of time. Under conditions of prolonged (8 hours) storage, the samples treated with terramycin gave better fertility than the control samples.

The effect of pH (a measure of acidity or alkalinity) on the survival time of spermatozoa and the time required to reduce a uniform amount of methylene blue was investigated in another phase of work. In general, a pH of about 7 (neutral) proved most desirable from the standpoint of survival time, but semen samples brought to a pH of 6 (acid), 7, or 8 (alkaline) produced about the same degree of fertility when artificially inseminated. (*Project M-33-j*)

Nutrition

Broiler Finishing Rations Conserve Protein and Reduce Costs

The results of several 10-week broiler tests conducted in floor pen units at College Park and Salisbury, reveal that the protein level of broiler rations may be reduced to 18 per cent after the broilers are 7 or 8 weeks old. This can be accomplished by reducing the level of soybean meal and adding additional ground corn to broiler starting rations. Such finishing rations will help to conserve the protein supply and reduce the cost of growing broiler chickens. When lower protein levels were used, poorer growth, feed efficiency and feathering were usually obtained. (*Project M-35-1*)

Methionine Supplementation of Broiler and Turkey Rations Receives Further Study

The value of supplemental amounts of the synthetic amino acid, DL-methionine, in practical rations for broilers and poults has received considerable attention. The effectiveness of adding this amino acid in broiler rations has varied greatly from trial to trial at this station. In some tests, no responses were noted, while in others, both the growth rate and efficiency of feed utilization were increased appreciably. An average of the results, however, reveals that the addition of this amino acid to broiler feeds has increased the return over feed costs more than



Barred Plymouth Rocks receiving orotic acid in a test at the University Poultry Farm on the College Park campus. Twenty-six floor pens are available there for broiler studies.

enough to offset the cost of methionine. The test with turkey poult failed to show any value for supplemental DL-methionine. The reason for the variability in the results obtained at this station and elsewhere are not clear. Nevertheless, the results warrant further study along these lines in order to determine more fully the practical role of additional DL-methionine in present-day feeds. (*Project M-35-i*)

Aureomycin HCl and 3-nitro-4-hydroxyphenylarsonic Acid Found to Supplement Each Other

In a broiler trial conducted under practical conditions, the addition of 10 grams of aureomycin HCl plus 45 grams of 3-nitro-4-hydroxyphenylarsonic acid to a broiler ration improved the growth rate of broilers to 10 weeks of age more than was obtained with either supplement fed alone. The combination of these drugs improved the return over feed costs \$32.95 per thousand broilers started. In this trial, several diseases were encountered which may have played an important role in determining the effectiveness of these drugs. The addition of both aureomycin and the arsonic acid compound reduced the average mortality from an average of 12 per cent to 5.7 per cent. (*Project M-35-l*)

Chicks May Not Always Make Full Use of Lysine in Ration

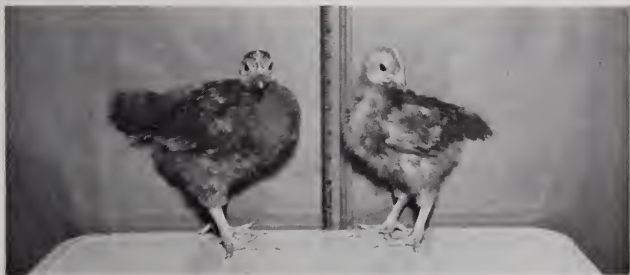
In studies involving purified chick rations containing wheat

gluten and an isolated soybean protein, it was found that supplemental lysine increased the growth rate of chicks even though the diet contained more than .9 per cent, which has been considered to be an adequate amount. Either the lysine requirement of the chick is greater than .9 per cent of the total diet or the lysine supplied by the wheat gluten and/or the isolated protein from soybean meal was not entirely available to the chick. Other work, however, involving the use of lysine as a supplement to practical type broiler rations did not reveal a deficiency of this amino acid. (*Project M-35-i*)

Fundamental Studies Continued on Unidentified Growth Factors

Studies on the multiplicity of factors in the "unknown growth factor complex," the development of more sensitive assay procedures, the fractionation and purification of two distinct unidentified chick growth factors and practical studies designed to determine sources of these factors have been conducted.

Using chick growth as a criterion of measurement, the effect of different carbohydrate sources, certain growth promotants, iodinated casein, increased levels of B-complex vitamins, and multiple deficiencies of unidentified factors has been studied with semi-purified diets. The results indicate that the use of 0.3 per cent iodinated casein (protamone) and/or sucrose, instead of cere'ose, increases the growth response of the chick to an unidenti-



These 4-week old chicks received similar purified diets, except that the one on the left received a concentrate containing an unidentified growth factor present in liver.

fied factor in certain liver preparations. Increased levels of B-complex vitamins or the addition of 20 ppm. of aureomycin HCl and 50 ppm. of 3-nitro-4-hydroxyphenylarsonic acid, alone and in combination, spared the dietary requirement for this factor. Limited data indicate that multiple deficiencies of members of the "unknown factor complex" influence the chicks' ability to respond to a single factor alone.

Evidence has been obtained which indicates that strain differences influence the chicks' requirement for the "liver factor." Two strains of New Hampshires, developed primarily on the basis of high and low thyroïdal responses to the feeding of thiouracil, were used.

In a series of experiments in which sex was determined at 4 weeks, it was also observed that female chicks responded to a greater extent than did males to the factor in liver preparations or fish solubles.

Other growth promotants, including procaine penicillin G, aureomycin, bacitracin, terramycin, streptomycin sulfate, polymyxin B, and sulfasuxadine have been used in various combinations without improving the sensitivity of the chick growth assay for either the "liver factor" or the "whey factor."

The results of a series of experiments involving purified diets strongly indicate that at least *three* unidentified chick growth factors are required under certain conditions. Alfalfa meal, forage grass juice and a corn fermentation product appear to be good sources of the third factor while liver products and dried whey products, respectively, contain the other two (mentioned above). Fish solubles appears to contain the "liver factor" and the "alfalfa factor." Dried whey and dried brewers' yeast both appear to contain mixtures of these factors, which vary to some extent from sample to sample.

Additional evidence confirms the previous observation that at least two



Wire floors keep these hens from picking at their droppings. The hens maintained on these floors are used as a source of chicks for studies involving unidentified growth factors which may be made by bacteria in the litter.

unidentified growth factors may be limiting in certain corn-soybean oil meal type practical rations. One of these appears to be present in fish meal, crab meal, liver meal, whale solubles, fish solubles and certain meat scraps. The other is present in dried whey products, brewers' dried yeast, molasses distillers' dried solubles, grain distillers' dried solubles and corn dried fermentation solubles. Antibiotics reduce the requirement for these unknown factors generally but do not eliminate the need for supplemental amounts in most cases. In the presence of an antibiotic, orotic acid was also found to stimulate growth of broilers from 4 to 10 weeks of age, even though dried whey or molasses distillers' dried solubles and fish meal were also fed. (*Project M-35-g*)

Fish Solubles Contains an Unidentified Factor Required for Hatchability

Evidence has been obtained with hens to show that fish solubles contain an unidentified factor required for hatchability of eggs. A practical type ration and wire floor pens were used in this work. One group, maintained on litter, also showed a much lower response to the hatchability factor indicating that free access of hens to their droppings may lower the amount of the factor required in the ration. (*Project M-35-g*)

Microbiological Studies Conducted on Unidentified Growth Factors

Bacteria may require the same nutrients that are required by poultry. Many new vitamins have been isolated through the use of bacteria, which are then available for study in

poultry nutrition. The isolation of vitamin B₁₂ is a classic example of the use of bacteria in vitamin research and its consequent wide application in poultry feeding. Studies in bacterial nutrition may, therefore, be considered as fundamental research in connection with poultry nutrition.

In other poultry research, evidence has been found for two or three unidentified chick growth factors. If a bacterium can be found which requires the same growth factors, much time, money, and effort could be saved in the isolation of these new growth factors for poultry.

During the past year, work on unidentified factors for bacteria has proceeded hand-in-hand with the study and concentration of growth factors for chicks and poults. An assay for an unidentified growth factor for *Lactobacillus bifidus* has been developed. This organism was isolated from both chicks and poults. Maryland researchers had found high numbers of *L. bifidus* to be correlated with poor chick and poult growth. The growth for *L. bifidus* is found in fish solubles, yeast, alfalfa, grass juice, soybean products, liver, whey and various fermentation products. These same substances have been reported to contain chick growth factors. As our knowledge of the number of unidentified factors for chicks is clarified and concentrates of the chick growth factors are prepared, it may become possible to use the *L. bifidus* assay as an aid in the rapid concentration of the unidentified substances.

Two other microbiological assays were studied during the past year. Work has been continued on the nutritional requirements of *Microbacterium flavum*. An improved and shortened assay procedure has been devised. Data indicate that an unidentified nutrient is still required by the organism. One, at least, is stable to treatment with acid, alkali and other reagents. This can be found in soybean meal, trypsin, asparagus juice, yeast extract and peptones. Another material further increases growth. It has been found in yeast extract, trypsin and peptones. Fractionation on both substances is being continued in the hope of characterizing the material further.

Work on the nature of another postulated unknown growth factor, "strepogenin" has also been continued. This project has dealt mainly with the nutrition of microorganism (*Lactobacillus bulgaricus* 09) which requires a factor from casein, hemoglobin or other sources for growth. A peptide fraction has been isolated from trypsinized globin which contains 11 amino acids, with leucine and valine predominating. These findings may prove to be valuable in studying the unknown factors for poultry. (Project M-35-k)

Mechanism of Antibiotic Action in Chick Growth Studied

Previous work on this project has shown that chicks fed procaine penicillin G have higher *Aerobacter aerogenes* and *Escherichia coli* counts in the ceca than chicks receiving no antibiotic. Conversely chicks not re-

ceiving antibiotics have greater numbers of *Lactobacillus bifidus* in the ceca, which is correlated with slower growth. This effect is accentuated when lactose is fed.

During this year, pure cultures of *Aerobacter aerogenes*, *E. coli* and *Lactobacillus bifidus* were grown, lyophilized and fed (in the diet or by oral inoculation) to determine their effect on chick growth, response to penicillin, and effect on nutrient requirements. In a series of tests using a soybean meal corn type ration and an oat groats fish meal type ration, the addition of either *Aerobacter aerogenes* or *Escherichia coli*, or both, in the presence of procaine penicillin G improved the growth promoting effect of the antibiotic 60 to 84 per cent, respectively. The feeding of these viable cultures had no appreciable influence in the absence of the antibiotic. When lyophilized cultures of *Lactobacillus bifidus* were fed in conjunction with 10 per cent lactose, a slight growth depression resulted.

Study Made of Effect of Vitamin B₁₂ Inhibitors on Development of Chick Embryos

Using 50 gamma of 1, 2-diamino-4, 5-dichlorobenzene per deficient egg, the normal embryological death peak (at 5 days) due to vitamin B₁₂ deficiency has been greatly exaggerated; another death peak occurred at

8-9 days, and all embryos were dead by the 13th day of incubation. Abnormal development also has been observed in these embryos. It is hoped that further studies will show the site of action of the B₁₂ inhibitors. (Project M-35-k)

The Role of Wheat in Pullet Disease Investigated

Investigation has been made for a number of years of the possible role of wheat in pullet disease, which had been reported by Maryland poultrymen. Previously reported work by this Station tended to confirm this suspicion, and it was found that there was a significant difference in both germination and bacterial content of wheats which favored the appearance of pullet disease and those which did not. Method of harvest alone could not explain the difference in behavior of wheat samples used, but it could be a contributing factor. Attempts to isolate and concentrate, and in general, to transmit pullet disease at will, have not been successful. In the current year, the beneficial effect of 100 grams of terramycin per ton of mash was demonstrated in a mild outbreak, but the circumstances were such that the disturbance, which closely resembled typical pullet disease, could have resulted from feeding of the particular lot of wheat administered. (Project M-45)

Rural Sociology

Labor Use On The Lower Eastern Shore

Farm operators raising truck crops were asked their experiences with respect to methods of recruiting, hours worked and wages paid, and supply and retention of harvest laborers in the 1952 harvest season. They were asked to compare 1952 with 1951 with respect to wages, ease of obtaining harvest labor, and the organization of enterprises on their farms.

It was found that the farmer's size of truck crop operation (less than 20 acres in truck was a small operation, 20-79 acres was medium and 80 or more acres was large) was associated with many factors involved in use of farm labor. More of the larger operators belonged to labor camp associations, used placement services of public agencies, made pre-season arrangements with harvest laborers, maintained a continuing employer-employee relationship with harvest laborers from one year to another, adjusted their organization of enterprises so that farm laborers were more effectively employed, and used migratory farm laborers rather than local labor. Also, size of operation was associated with wages paid to harvest laborers, hours worked in harvesting crops, and the number of laborers employed in daily crop harvesting.

Studies Made of the Family in the Rural-Urban Fringe

The problem of this study was to investigate the relationships which exist between family type and selected social and economic data, the relationship between family type and intra-family participation, and the relationship between family type and participation in community organizations. Only white families in which at least a husband and wife were present in the household were included in the analysis.

The family types were established with respect to rural or urban residence, presence or absence of children and presence or absence of outside adults in the family. Lastly, age of the youngest child, where the family included children, was used to further classify the family types. The most important conclusion of this study is that high participation within the family usually goes hand-in-hand with high participation in community activities. Generally, most intra-family participation fell in the following kinds of activities: attending church services, caring for home and garden, eating meals, listening to the radio, picnicing, attending sports events, and various other recreational activities. Participation in community activities was determined by membership in and

Table 3. Interrelation Between Intra-Family and Community Participation of White Husbands and Wives, Prince George's County, 1949

Participation in Community Organizations	Number of intra-family activities participated in:					
	No Family Activities	One Family Activity	Two Family Activities	Three Family Activities	Four or more Family Activities	Total
Total	270	207	307	326	610	1,722
Inactive in Community	202	144	200	188	282	1,017
Active in Community	68	63	107	138	328	705

chi square value for table = 83.675, $P = .001$

attendance at meetings of community organizations. Homemaker's Clubs, PTA's, fraternal societies, civic and service clubs, professional organizations, labor unions, church societies, and citizens associations were the kinds of organizations most often mentioned by respondents. Active persons belonged to organizations and attended their meetings,

inactive persons either did not belong or did not attend meetings if they belonged to an organization.

Table 3 displays the interrelation between the two kinds of social participation for all the husbands and wives. (Because rural and urban samples were similarly distributed, these are combined in this table.)

Soil Conservation Research

Winter Cover Crop Management for Tobacco

Tests of winter cover crops on sandy soils continued to give increased returns where mixtures of vetch with wheat, rye or ryegrass were used compared with no cover and ryegrass alone. Late turning of these same mixtures further increased returns. The early turning date was around April 15th while the late turning date was about one month later.

These studies show that the late-turned material had to be thoroughly mixed with the soil to obtain good results.

Rotations for Tobacco

Preliminary studies of tobacco rotations indicate that two and three year rotations may have many practical advantages over continuous tobacco. More comprehensive studies of this problem are now under way.

Supplemental Tobacco Irrigation

Preliminary studies of supplemental irrigation with tobacco indicate that increased production is not easy to obtain on light textured soils because of leaching problems associated with the near-coincidence of irrigation and subsequent rainfall. The problem of replacing critical nutrient

losses and maintaining a balanced nutritional equilibrium throughout the growing season has not been solved.

Further Studies on Ridge Row Culture

Ridge row culture of tobacco is being studied as a method of preventing cross wash erosion of the soil while providing an efficient drainage system for the crop rows. Removing excess water from tobacco fields with graded ridge rows calls for improved sodded waterways and outlet designs. Studies are also needed to consider land smoothing operations, terrace placement and the possible use of strip-cropping with fewer terraces.

Results of four seasons' studies comparing ridge row culture with conventional tobacco cultivation show the ridging to be particularly beneficial in seasons with unusually heavy rainfall during the early part of the growing season. In one of these heavy rainfall seasons, the increased return due to ridging amounted to \$117 per acre while in the other the increase amounted to \$66 per acre. In the two years without unusually heavy rainfall, the yields and values were about the same for both treatments.

Publications

Bulletins

- 444 Pasture Mixtures for Beef Production. A. W. Burger and J. E. Foster. 15 pp. June, 1953.
- 445 Cause and Control of the Red Stele Disease of Strawberries. W. F. Jeffers. 8 pp. June, 1953.
- A74 Research—The Key to Agricultural Progress . . . 65th Annual Report. I. C. Haut. 88 pp. November, 1952.
- A75 A Classification of the Coccid Family Aclerididae (Coccoidea Homoptera). H. S. McConnell. June, 1953.
- A76 Sales Taxes and Their Applications to Farmers. W. P. Walker and F. E. Hulse. June, 1953.

Scientific Journal Articles and Miscellaneous Periodicals, Reports, Proceedings, etc.

Department of Agricultural Economics

- 144 A Study of the Merchandising of Poultry and Eggs in Retail Stores. H. Smith and F. Dallavalle. (*Multigraphed Circular*) 33 pp. July, 1952.
- 150 Apple Marketing Bibliography. Clementine B. Anslinger. (*Mimeographed Circular*) 184 pp. December, 1952.
- 158 Marketing of Tri-State Canned Vegetables. Part I Distribution Pattern—1949 Pack. D. J. Burns. (*Multigraphed Circular*) 53 pp. February, 1953.
- 164 Property Taxation of Poultry and Young Livestock in Maryland. W. P. Walker, H. D. Smith and P. E. Nystrom. (*Mimeographed Circular*) 12 pp. May, 1953.
- 166 Extent and Nature of Bruising of Maryland Peaches from Orchard to Retail Store. G. A. Stevens. (*Multigraphed Circular*) 65 pp. May, 1953.
- 167 Broiler Costs and Returns 1947-52. H. D. Smith. (*Multigraphed Circular*) 30 pp. June, 1953.
- 169 Problems of Economic Security for Farmers in Reference to Social Security. P. R. Poffenberger. (*Multigraphed Circular*) 40 pp. June, 1953.
- 170 Recent Trends in Farm Tax Liabilities in Maryland. W. P. Walker, F. E. Hulse and P. E. Nystrom. (*Multigraphed Circular*) 24 pp. June, 1953.

Department of Agricultural Engineering

- A382 Drying Corn with Unheated Air. G. J. Burkhardt. (*Mimeographed Circular*). 9 pp. August, 1952.

Department of Agronomy

- 149 A Field Study of Rates and Dates of Applying Certain Chemicals for Control of Chickweed in Alfalfa. L. F. Morris and A. O. Kuhn. *Proc. N. E. Weed Control Conf.* 7:213-219. January, 1953.
- 156 Sweet Corn Field Trials of 1952. R. G. Rothgeb. (*Mimeographed Circular*) 8 pp. February, 1953.
- 157 The Performance of Hybrid Corn in 1952. R. G. Rothgeb. (*Planographed Circular*) 15 pp. February, 1953.
- A406 Influence of Phosphorus, Potassium and Calcium on the Availability of Phosphorus and Potassium. H. ElDamaty and J. H. Axley. *Soil Sci.* (In press)

Department of Animal Husbandry

- 145 Early Weaning of Beef Calves for Earlier Evaluation of Rate and Economy of Gain. J. Buric, W. W. Green and J. E. Foster. *Jour. Animal Sci.* 11 (4):737-738. November, 1952.
- A394 Comparative Performance of Beef Calves Weaned at 90 and 180 days of Age. W. W. Green and J. Buric. *Jour. Animal Sci.* (In press)

Department of Botany

- 152 Botryosphaeria Rot of Apple. L. O. Weaver. *Trans. Peninsula Hort. Soc.* 42(5):-66-67. December, 1952.
- A377 The Role of Boron in the Translocation of Sucrose. H. G. Gauch and W. M. Dugger, Jr. *Plt. Physiology*. (In press)
- A386 Embryo Formation in *Lilium regale*. E. H. Wils. R. D. Rappleye. 1953 *Yr. Book North Amer. Lily Soc.* (In press)
- A424 Additional Records of Spot Anthracnoses in Maryland. R. A. Jehle, A. E. Jenkins and W. F. Jeffers. *Plt. Disease Reprtr.* 37(6):371-372. June, 1953.
- A425 Increased Translocation of Plant Growth Modifying Substances Due to Application of Boron. J. W. Mitchell, W. M. Dugger, Jr., and H. G. Gauch. *Sci.* (In press)
- A427 Metabolism of Germination Conidia of *Fusarium roseum*. C. E. Cox and H. D. Sisler. *American J. of Botany*. (In press)
- A428 Metabolism of Conidia of *Fusarium roseum* as Affected by Tetramethylthiuram-disulfide. H. D. Sisler and C. E. Cox. *American J. of Botany*. (In press)

Department of Dairy Husbandry

- 142 Use of Calcium Sulfate in Ice Cream. W. S. Arbuckle. *Ice Cream Field.* 60(3):132-134-136. September, 1952.
- 146 Application of High Temperature, Short Time Pasteurization of Ice Cream Mix as Related to the Use of Different Stabilizers. W. S. Arbuckle and J. W. Nisonger. *Int. Assoc. Ice. Cream Mfg. Rep. of Proc.—48th An. Con. Prod. and Lab. Council* 2:22-29. 1952.
- 153 Chromatographic Determination of Butyric Acid and the Detection of Milk Fat Adulteration. Mark Keeney. (*Printed Circular*) 14 pp. January, 1953.
- 159 The Effect of Developed and Adjusted Acidity on the Various Properties of Ice Cream Mix and the Finished Ice Cream. R. F. Drawbridge and W. S. Arbuckle. *Ice Cream Field.* (In press)
- 162 Farm Tank Truck Pick-Up of Milk, Charting the Course for Tomorrow. W. S. Arbuckle. *Jour. Milk and Food Tech.* 16(3):141-142. May-June, 1953.
- 163 Detection of Milk Fat Adulteration: Further Observations on the Butyric Acid Determination. Mark Keeney. *The Ice Cream Trade Jour.* 49(5):30, 32, 109. May, 1953.
- 165 A Presumptive Crystallization Test for Milk Fat Adulteration. Mark Keeney. *The Ice Cream Trade Jour.* 49(6):30, 188. June, 1953.
- 168 Perfusion Technique in Tracer Studies of Milk Secretion. S. Lakshmanan, S. Kumar, D. R. Jacobson and J. C. Shaw. (*Mimeographed Circular*) 9 pp. June, 1953.
- A379 The Bacteriology of the Bovine Rumen: A Review. R. N. Doetsch and R. Q. Robinson. *Jour. Dairy Sci.* 36(2):115-142. February, 1953.
- A383 The Hyperventilation and Other Factors Affecting the Rate of Blood Flow in the Perfusion of Excised Bovine Mammary Glands. S. Kumar, S. Lakshmanan, E. A. Corbin and J. C. Shaw. *Amer. Jour. of Physiology* 173(1):82-88. April, 1953.
- A393 The Role of Plant Pigments in Digestion Trials. H. M. Irvin, H. G. Wiseman, J. C. Shaw and L. A. Moore. *Jour. Animal Sci.* (In press)
- A398 The Rate of Milk and Butterfat Secretion of Cows Injected with Oxytocin and Milked at Two Hour Intervals. R. E. McDowell, M. F. Ellmore, J. C. Shaw and M. H. Fohrman. *Jour. Dairy Sci.* (In press)
- A399 Studies on Ketosis in Dairy Cattle, XVI: The Pituitary-Adrenal Cortical Syndrome. J. C. Shaw, B. C. Hatzios, E. C. Leffel, A. C. Chung, W. M. Gill and Janet Gilbert. *North Amer. Vet.* 34:251-256. April, 1953.
- A408 The Possible Use of Plant Pigments as a Marker in Digestion Trial Studies. H. M. Irvin and H. G. Wiseman. *Jour. Dairy Sci.* 36(6):582 (Abstract) June, 1953.
- A409 The Catabolism of Carbon Compounds by Bovine Rumen Bacteria. R. N. Doetsch, R. Q. Robinson and J. C. Shaw. *Jour. Dairy Sci.* (In press)
- A410 The Dissimilation of Amino Acids by Bovine Rumen Bacteria. F. M. Sirotnak and R. E. Brown. *Jour. Dairy Sci.* 36(6):588 (Abstract). June, 1953.
- A411 Nutritional Requirements of Bovine Rumen Bacteria. J. J. McNeill, R. N. Doetsch and R. Q. Robinson. *Jour. Dairy Sci.* 36(6):588 (Abstract). June, 1953.

- A412 Rumen Studies on Normal and Ketotic Cows. R. E. Brown. *Jour. Dairy Sci.* 36(6):597 (Abstract). June, 1953.
- A413 Perfusion Technique in Tracer Studies of Milk Secretion. S. Lakshmanan, S. Kumar and D. R. Jacobson. *Jour. Dairy Sci.* 36(6):589 (Abstract). June, 1953.
- A414 The Effect of Somatotropin Upon Milk Production and Various Blood Substances of Lactating Cows. A. C. Chung, J. C. Shaw and W. M. Gill. *Jour. Dairy Sci.* 36(6):589. (Abstract) June, 1953.
- A426 Amino Acid Degradation by Mixed Suspensions of Bovine Rumen Bacteria. F. M. Sirotnak, R. N. Doetsch, R. E. Brown and J. C. Shaw. *Jour. Dairy Sci.* (In press)

Department of Entomology

- 113 The Vinegar Gnat: Tomato Problem of 1952. L. P. Ditman. *Canning Trade*. August 11, 1952.
- 151 New Insecticides, Descriptions and Recommendations. L. P. Ditman. *Canning Trade*. March 6, 1953.
- A380 The Biology and Control of *Brevipalpus australis* (Tucker) (Acarina: Phytotipalpidae) G. R. Manglitz and E. N. Cory. *Jour. Econ. Entom.* 46(2):116. 1953.
- A385 Notes on the Alfalfa Weevil in Maryland. F. W. Poos and T. L. Bissell. *Jour. Econ. Ent.* 46(2):178. 1953
- A387 Studies on Sap Beetles in Maryland. R. M. Lee, G. S. Langford and E. N. Cory. *Jour. Econ. Ent.* 46(2):366. 1953.
- A388 Studies on Some of the Newer Insecticides for Japanese Beetle Control. G. S. Langford, W. C. Harding and B. S. Lall. *Jour. Econ. Ent.* 46(2):262. 1953.
- A389 The Control of Apple Pests and the Effects of Different Spray Programs on Fruit Finish 1952. C. Graham. *Trans. Peninsula Hort. Soc.* 42(5):45-50. 1952
- A390 The Control of Peach Insects and Observations on the Finish of Golden Delicious Apples in an Inter-Planted Orchard 1952. C. Graham. *Trans. Peninsula Hort. Soc.* 42(5):45-50. 1952.
- A396 On the Performance of Malathion for Control of the Pea Aphid. L. P. Ditman, Amihud Kramer and A. O. Saulsbury, Jr. *Jour. Econ. Ent.* (In press)
- A402 Spraying and Dusting for More Beans. L. P. Ditman. *Proc. Md. Veg. Growers Assoc.* (In press)
- A417 Spraying and Dusting Cucumbers for Pickles. L. P. Ditman, F. C. Stark, C. E. Cox and H. S. Todd. *Canning Trade*. May, 1953.

Department of Horticulture

- 147 Statistical Quality Control in the Food Industry. Amihud Kramer. *Food Engineering* 24(12):100-108. December, 1952.
- 155 Bibliography of Scientific Contributions in the Field of Horticulture by the Agricultural Experiment Station, University of Maryland. L. E. Scott. (*Mimeographed Bibliography*) 37 pp. January, 1953.
- 160 Stem Cutting Propagation of Rhododendrons. Bernard Bridgers and P. W. Cornell. *Florists' Exchange*, pp. 10-11. May 23, 1953.
- 161 Sweet Potato Production in Maryland. L. E. Scott. *Proc. Md. Veg. Growers Assoc.* (In press)
- A376 Influence of Mineral Nutrition on Production, Rooting and Survival of Cuttings of Azaleas. W. H. Preston, Jr., J. B. Shanks and P. W. Cornell. *Proc. Amer. Soc. Hort. Sci.* 61:499-507. 1953.
- A381 The Shear-Press, an Instrument for Measuring the Quality of Foods, III: Application to Peas. A. Kramer and K. Amid. *Proc. Amer. Soc. Hort. Sci.* (In press)
- A384 Studies of Factors Inhibiting the Rooting of Rhododendron Cuttings. Bernard T. Bridgers. *Quarterly Bul. Amer. Rhododendron Soc.* 6(4):1-37. 1952, 7(1) 1953.
- A392 The Present Status of Hormone Sprays for Thinning of Apples and Peaches. A. H. Thompson. *Trans. Peninsula Hort. Soc.* 42(5):56-61. 1952.
- A404 Effect of Application of Heat on Tomato Juice Color. A. Kramer and A. A. ElKattan. *Food Technology*. (In press)
- A405 Sampling Procedure for Grading of Tomatoes. A. Kramer, W. A. Ogle and B. W. Clarke. *Food Technology*. (In press)
- A407 A Survey of the Nutritional Status of Maryland Orchards by Leaf Analysis—A Progress Report. *Proc. Md. Hort. Soc.* (In press)

- A416 Recommendations on Procedures for Determining Grades of Raw, Canned and Frozen Lima Beans. Amihud Kramer. *Food Technology*. (In press)
- A423 Fertilization During the Growing and Forcing Periods on Growth and Flowering of Hydrangeas. J. B. Shanks and C. B. Link. *Proc. Amer. Soc. Hort. Sci.* (In press)

Department of Poultry Husbandry

- 148 Effect of Methionine Supplementation and Different Protein Levels on Growth and Feed Requirements of Broiler Chickens. G. F. Combs, P. F. Twining and C. K. Laurent. (*Mimeographed Circular*) 6 pp. October, 1952.
- 151 The Value of Aureomycin HCl and 3-Nitro-4-Hydroxyphenylarsonic Acid in Broiler Rations. G. F. Combs and C. K. Laurent. (*Mimeographed Circular*) 7 pp. February, 1953.
- A378 Evidence for an Unidentified Growth Factor Required by Microbacterium Flavum. R. W. Bishop, Mary S. Shorb and M. J. Pelczar. *Proc. Soc. Exp. Biol. and Med.* 81:407-410. November, 1952.
- A391 Further Evidence of an Unidentified Hatchability Factor in Condensed Fish Solubles. G. H. Arscott and G. F. Combs. *Poultry Sci.* 32(4):730-733. July, 1953.
- A395 Effect of Supplemental DL-Methionine and Varying Protein Levels of Growth and Feed Requirements of Broiler Chickens. H. Menge, C. A. Denton, H. R. Byrd and G. F. Combs. *Poultry Sci.* (In press)
- A400 The Effect of Orally Administered Penicillin-Resistant Microorganisms on the Growth of Chicks. G. Lynn Romoser, Mary S. Shorb and G. F. Combs. *Proc. Soc. Exp. Biol. and Med.* 83:17-21. 1953.
- A415 Unidentified Factors for Poultry. G. F. Combs. *World's Poultry Sci. Jour.* 9(2):93-96. April-June, 1953.
- A418 Nutritional Requirements of *Lactobacillus bifidus* Isolated from Chicks and Poults. F. A. Veltre, Mary S. Shorb and M. J. Pelczar, Jr. *Proc. Soc. Exp. Biol. and Med.* 83:284-286. 1953.
- A419 A Study of the Physiological Mechanisms Affecting Specific Gravity of Chicken Eggs. A. R. Gabuten and C. S. Shaffner. *Poultry Sci.* (In press)
- A420 Effect of Aureomycin HCl on the Utilization of Inorganic Nitrogen by the Chick. H. L. Jones and G. F. Combs. *Poultry Sci.* (In press)
- A421 An Arched-Neck Character in Chickens. M. H. Conner and C. S. Shaffner. *J. Heredity*. (In press)
- A422 Unidentified Growth Factors Required by Chicks and Poults, III: Chick Studies Involving Practical-Type Rations. G. F. Combs, G. H. Arscott and H. L. Jones. *Poultry Sci.* (In press)

Current Projects

Agricultural Economics and Marketing

Project No.

- A-18-ac Organization and Operation of Representative Types of Farms in Maryland. A. B. Hamilton and W. D. Stevenson.
- A-18-ag Agricultural Productive Capacity and Efficiency. A. B. Hamilton and P. E. Nystrom.
- A-19-k Recent Tax Changes in Maryland and Their Effect on Farmers' Tax Obligations. P. E. Nystrom, W. P. Walker and P. R. Poffenberger.
- A-19-m Rural Cooperative Credit. P. R. Poffenberger, W. P. Walker and R. W. Roberson.
- A-19-n Economic and Security Aspects of Rural Fire Protection and Prevention in Maryland. W. P. Walker, P. R. Poffenberger, F. E. Hulse, L. C. Biser and E. M. Downey.
- A-19-o Conservation and Economy in Rural Transportation of Persons, Supplies and Farm Commodities. W. P. Walker, L. C. Biser, F. E. Hulse and E. M. Downey.
- A-19-p Factors Affecting the Cost of Certain Kinds of Insurance to Farmers. W. P. Walker, P. R. Poffenberger and F. E. Hulse.

- A-19-q Maryland Tax Assessment Practices Concerning Various Classes of Poultry. W. P. Walker and H. D. Smith.
- A-26-1 Prices Paid by Farmers for Commodities Bought. P. R. Poffenberger.
- A-26-ab The Marketing and Distribution of Maryland Canned Vegetables. D. J. Burns.
- A-26-ac Reducing Costs, Determining and Maintaining Quality, Increasing Efficiency in Marketing Maryland Poultry Products. H. D. Smith and Francis Dallavalle.
- A-26-ad Possible Economics in the Marketing and Transportation of Poultry Meat. H. D. Smith.
- A-26-ae Lowering Marketing Costs: Increasing Efficiency in the Operation of Milk Receiving, Processing and Distribution Facilities. G. M. Beal and C. E. Twining.
- A-26-af *Sub. 1* Collection of Basic Data on Marketing Shenadoah-Cumberland Apples. R. L. Childress, C. B. Anslinger, and P. R. Poffenberger.
- A-26-af *Sub. 2* Processors as a Market Outlet for Cumberland-Shenadoah Apples. R. L. Childress and P. R. Poffenberger.
- A-26-ag Marketing of Maryland Type 32 Tobacco. G. M. Beal and Paul Summers.
- A-26-ah Marketing Maryland Forest Products. G. M. Beal and B. R. Roberson.
- A-26-ak A Study of Related Practices and Egg Quality in Baltimore. H. D. Smith, R. C. Hawes, J. Horne and A. Lundquist.
- A-32-f Farm Tenancy and Leasing Arrangements in Maryland. L. B. Bohanan and A. B. Hamilton.
- A-32-h The Effect of Drainage Upon Crop Yields, Farming Practices and Land Utilization. L. B. Bohanan.
- A-32-i Rural Zoning in Maryland. L. B. Bohanan.

Agricultural Education

Project No.

- T-1 Possibilities of Education with Adult Farmers. R. A. Murray and A. M. Ahalt.

Agricultural Engineering

Project No.

- R-11-c Mechanization of Tobacco Production. R. W. Carpenter, G. J. Burkhardt, P. N. Winn, Jr., E. W. Martin, O. E. Street and Claude McKee.
- R-11-d Tobacco Housing. R. W. Carpenter, G. J. Burkhardt, P. N. Winn, Jr., E. W. Martin, O. E. Street and Claude McKee.
- R-11-e Structures and Equipment for Tobacco Stripping. R. W. Carpenter, G. J. Burkhardt, P. N. Winn, Jr., E. W. Martin, O. E. Street and Claude McKee.
- R-12 Drying Ear Corn with Natural Air in Maryland. G. J. Burkhardt, H. J. Hofmeister, Jr., P. N. Winn, Jr. and R. G. Rothgeb.
- R-14 Mow Curing Hay in Maryland. H. J. Hofmeister, Jr.
- R-15 Development of Equipment and Improved Methods for Harvesting Canning Tomatoes and Bush Beans. H. J. Hofmeister, Jr.

Agronomy

Project No.

- B-39 Varietal Improvement of Wheat. R. G. Rothgeb, J. L. Newcomer, J. H. Axley, H. B. Winant and J. R. Miller.
- B-41 Barley—Variety Testing. R. G. Rothgeb.
- B-43 Soybean Production in Maryland. R. G. Rothgeb, R. C. Leffel and S. P. Stabler.
- B-44 Sweet Corn Improvement. R. G. Rothgeb.
- B-50 Improvement of Dent Corn. R. G. Rothgeb.
- B-56-a Improvement of Red Clover Adapted to Maryland. A. M. Decker, T. S. Ronningen and C. H. Liden.
- B-56-b Pasture Renovation Studies. A. W. Burger, T. S. Ronningen and A. O. Kuhn.
- B-56-f The Evaluation of Forage Crop Varieties and Strains for their Use and Adaptation in Maryland. T. S. Ronningen, A. W. Burger and A. O. Kuhn.
- B-56-g Development and Maintenance of Superior Ladino Clover Breeding Material. T. S. Ronningen.
- B-56-i Orchard Grass Breeding. T. S. Ronningen and A. W. Burger.

- B-56-j Grass and Legume Combinations for Beef Production. A. W. Burger, J. E. Foster, E. C. Spurrier and T. S. Ronningen.
- B-56-k Phenological Studies in Forages. A. M. Decker, Jr., T. S. Ronningen and H. C. S. Thom.
- B-56-l Variety and Strain Testing of Forage Legumes and Grasses in Maryland. T. S. Ronningen and A. M. Decker, Jr.
- B-57 The Improvement, Production and Use of Rye in Maryland. R. G. Rothgeb.
- B-58-a Control of Weeds in Corn by the Use of 2, 4-D, Preparations. A. M. Decker and R. G. Rothgeb.
- B-58-b Control of Weeds in Legumes. A. O. Kuhn and A. M. Decker, Jr.
- B-59 Improvement in Plant Bed Management for Maryland Tobacco. O. E. Street, O. D. Morgan, Jr., and J. E. McMurtrey, Jr.
- B-60 Tobacco Fertilizer Rates and Placement in Relation to Plant Population. O. E. Street, C. G. McKee, A. O. Kuhn and J. E. McMurtrey, Jr.
- B-61 Effects of Cropping Systems on Soil Properties and Productivity. Edward Strickling, R. G. Rothgeb and A. O. Kuhn.
- B-64 Testing Commercially Acceptable Maryland Tobacco Varieties as Related to Quality. L. R. DeLoach and O. E. Street.
- O-28-b A Study of the Formula and Analysis for Late Potatoes. J. H. Axley and H. B. Winant.
- O-43 Hydrologic Studies with Reference to Soil Moisture Conservation, Soil Fertility and Flood Control. R. G. Rothgeb, Mitchell Thompson, T. S. Ronningen and H. W. Hobbs.
- O-45-b A Study of the Availability of Phosphate Material. H. B. Winant, S. P. Stabler and J. H. Axley.
- O-48 A Study of the Reclassification of Soils and the Adaptation of These Classes to Soil Conservation Work in Maryland. J. H. Axley, A. O. Kuhn, S. P. Stabler, F. L. Bentz, H. B. Winant and G. A. Bourbeau.
- O-51 Alfalfa Fertility Studies. J. H. Axley, H. B. Winant and J. R. Miller.
- O-52 A Study of Soil Tests as an Index of Phosphate Availability to Plants. J. H. Axley and H. B. Winant.
- O-53 Effects of Soil Physical Factors on Crop Production. Edward Strickling and R. G. Rothgeb.

Agronomy—Seed Inspection

Project No.

- N-7 Inspection of Seeds Sold Throughout the State. J. L. Newcomer, M. H. Day and A. O. Kuhn.
- N-8 Examination of Samples from Seeds Sold Throughout the State. F. S. Holmes, O. M. Kelk, E. P. Emack, A. H. Ferguson and R. W. Caldwell.
- N-9 Examination of Samples Submitted to the Laboratory. F. S. Holmes, O. M. Kelk, E. P. Emack, A. H. Ferguson and R. W. Caldwell.

Animal Husbandry

Project No.

- C-14 A Study of the Productiveness of Purebred Beef Cattle in Maryland. W. W. Green, J. E. Foster, J. Buric and W. J. Corbett.
- C-14-a Effect of Early Weaning on the Duration of Maternal Influences in Beef Calves. W. W. Green, J. Buric, J. E. Foster and W. J. Corbett.
- C-14-b Type Classification as an Aid in Selection of Beef Breeding Cattle. W. W. Green, J. E. Foster and J. Buric.
- C-14-c Studies on Bodily Conformation and the Correlations Between Live-Animals Measurements and the Weight and Other Characteristics of Carcasses of Wholesale Cuts in Beef Animals. W. W. Green.
- C-18 A Study of the Causes and Prevention of Bloat in Beef Cattle on Pasture. E. C. Leffel, J. E. Foster, S. P. Stabler and J. C. Shaw.
- C-20 The Development of Superior Lines of Swine Based in Crossbred or Purebred Foundations. W. W. Green, M. H. Kerr, J. E. Foster, J. Buric and W. J. Corbett.
- C-21 The Effect of Specific Metabolites Upon Growth Rate and General Condition of Sheep. E. C. Leffel, J. E. Foster and J. C. Shaw.

Animal Pathology

Project No.

- D-46 Investigations on Brucellosis of Cattle. Cornelia M. Cotton.
- D-50 Anaplasmosis of Cattle. L. J. Poelma, Kenneth Price and J. Walter Hastings, Sr.
- D-51 Experiments with Infectious Enterohepatitis (Blackhead) of Turkeys. H. M. DeVolt, Anita Holst and Frank Tromba.
- D-52 Newcastle Disease Investigations with Particular Reference to Vaccine Modifications and Virus Study. R. L. Reagan, W. C. Day, D. M. Schenck and A. L. Brueckner.
- D-53 A Study of Rumen Fermentation and Ruminant Metabolism with Emphasis on Their Relation to Ketosis. R. B. Johnson.
- D-54 Infectious Bovine Mastitis: Comparison of Different Methods of Diagnosis, Treatment and Control in the Same Herd. Comparison of Costs and Returns. E. M. Sacchi and Mrs. H. O. Lineweaver.

Botany

Project No.

- F-9 Cytogenetic Studies in the Genera *Ipomoea*, *Gladiolus* and *Tulipa*. R. Bamford, D. T. Morgan, Jr., R. A. Rappleye, and R. N. Stewart.
- F-12 The Native Plants of Maryland, Their Occurrence, Distribution and Economic Importance. R. G. Brown.
- F-15-a Heterosis in Hybrids from Homozygous Pepper Lines Obtained from Haploid Plants. D. T. Morgan, Jr., R. D. Rappleye and R. Bamford.
- J-78-a Breeding for Resistance to the Red Stele Disease of Strawberries Caused by *Phytophthora fragariae* Hickman and Studies Necessary to Facilitate the Development of Resistant Varieties and Other Control Measures. W. F. Jeffers, J. G. Kantzes and D. H. Scott.
- J-86-a Methods of Controlling Diseases Affecting Commercial Production of Sweet Potatoes in Maryland. W. F. Jeffers, C. E. Cox, J. G. Kantzes.
- J-87 Treatments for Control of Seed and Soil Borne Diseases of Vegetable Crops. C. E. Cox, H. D. Sisler, Paul Hochstein and Morton Marshall.
- J-88 Development of Identification and Control Procedures for Plant Virus Diseases in Maryland. W. F. Jeffers, L. O. Weaver, O. D. Morgan, J. R. Keller, O. E. Street, E. E. Clayton, D. A. Scott, G. M. Darrow.
- J-89 Development of Improved Strains of Maryland Tobacco Resistant to Diseases. O. D. Morgan, O. E. Street and E. E. Clayton.
- J-90 Adaptability of Disease Resistant Varieties of Potatoes to Maryland. C. E. Cox and J. G. Kantzes.
- K-8-b A Determination of the Concentrations of Various Inorganic and Organic Components Coincident with Maximal Yields of Certain Crop Plants in Maryland. H. G. Gauch and W. M. Dugger, Jr.
- K-8-c The Role of Trace Elements in Plant Nutrition. H. G. Gauch and W. M. Dugger, Jr.

Dairy Husbandry

Project No.

- G-34 Chemical Changes in Milk Fat as Related to the Flavor of the Milk. Mark Keeney and J. F. Mattick.
- G-35 The Analysis of Dairy Products. Mark Keeney, J. F. Mattick, W. S. Arbuckle and J. S. Conrad.
- G-37 The Feeding and Management of the Cow During the Dry and Freshening Period. J. C. Shaw, J. W. Pou, Janet Gilbert, B. C. Hatzios, W. M. Gill and R. A. Gessert.
- G-38 The Fat Metabolism of the Mammary Gland. J. C. Shaw, J. W. Pou, R. E. Brown and A. C. Chung.
- G-39 Factors That Affect the Availability of Nutrients in Feeds and Their Influence Upon Blood Composition and Milk Secretion. J. C. Shaw, J. W. Pou, H. M. Irvin, R. N. Doetsch and R. A. Gessert.
- G-40 The Influence of High Temperature Heat Treatment on Certain Physical and Chemical Properties of Milk. Mark Keeney, T. A. Fitzpatrick, Ibrahim Rifaat, and Louis Cremers.

- G-42 Methods of Processing and Other Factors Affecting the Quality of Ice Cream. W. S. Arbuckle, E. A. Corbin and Louis Creemers.
- G-43 The Metabolism of Acetate, B-hydroxybutyric Acid, Glucose and Other Carbon Compounds in Lactating Ruminants. J. C. Shaw, S. Lakshmanan, S. Kumar and D. R. Jacobson.

Entomology

Project No.

- H-29-g Insecticidal Control of the Mexican Bean Beetle. L. P. Ditman and J. G. Burkhardt.
- H-29-h Pea Aphid Control by Low Volume Sprays with Ground and Air Application. L. P. Ditman, G. J. Burkhardt, Amihud Kramer and H. S. Todd.
- H-29-i The Relation of Control of Cucumber Insects to Yield of Quality Pickles. L. P. Ditman, F. C. Stark and C. E. Cox.
- H-29-j Chemical Control of the Corn Earworm. L. P. Ditman and H. S. Todd.
- H-40 Biology and Control of Tobacco Insects. *Sub. I.* The Tobacco Horn Worms. H. S. McConnell and E. N. Cory.
- H-43 The Biology and Control of the European Corn Borer Under Maryland Conditions. E. N. Cory, H. S. McConnell, G. S. Langford and R. M. Lee.
- H-46-c Liquefied Gas Propelled Sprays for the Home Gardener. L. P. Ditman, H. B. Owens and Amihud Kramer.
- H-46-d Studies on the Efficiency of Fixed Boom Low Volume Sprayers. L. P. Ditman, G. J. Burkhardt, Francis Stark, C. E. Cox, Amihud Kramer and H. S. Todd.
- H-50-a The Control of Orchid Pests. E. N. Cory, Elizabeth Haviland, G. R. Manglitz and W. C. Acheson.
- H-56 Patuxent Project on the Effect of Soil Conservation Upon Insect Populations. H. B. Owens, E. N. Cory and L. P. Ditman.
- H-58 A Taxonomic Study of the Coccid Genus *Toumeyella* and Some Closely Related Genera. H. S. McConnell.

Home Economics

Project No.

- Y-1 The Utilization of Protein by Normal College Women. P. F. Brauscher and H. N. Wilson.

Horticulture

Project No.

- I-26-a Rooting of Ornamental Plants Difficult to Propagate. C. B. Link, J. B. Shanks and L. J. Enright.
- I-58-a A Physiological Study of the Keeping Qualities of Cut Flowers as Influenced by Packaging. J. B. Shanks, C. B. Link and J. E. Hawes.
- I-74-a Effect of Environmental Factors and Cultural Practices on the Growth and Flowering of Hydrangeas and Azaleas. C. B. Link and J. B. Shanks.
- I-79-a The Mineral Nutrient Requirements of the Azalea. C. B. Link and J. B. Shanks.
- I-79-b The Mineral Nutrition of the Hydrangea. J. B. Shanks and C. B. Link.
- L-58-g Determination of Varietal Adaptability of Maryland Grown Apples to Making of Canned and Frozen Concentrates and Development of Improved Methods of Preparation. E. P. Walls and L. E. Scott.
- L-73 Adaptation of Fruit Varieties and New Seedlings to Maryland. I. C. Haut and F. J. Lawrence.
- L-74 Environmental Factors and Cultural Practices in Relation to the Growth and Fruiting Responses of Fruits. A. H. Thompson, E. A. Stahly and I. C. Haut.
- L-74-a Relation of Environmental and Soil Factors to the Cracking of Sweet Potatoes. L. E. Scott, F. C. Stark, W. A. Matthews, A. A. El-Kattan, W. L. Ogle and A. A. Duncan.
- L-79-a Mineral Nutrition of the Strawberry with Particular Reference to Effects of Calcium, Potassium and Magnesium on Growth and Fruiting. I. C. Haut, L. E. Scott and A. A. Piringer.
- Q-58-f Develop Objective and Easily Applied Measures of Quality Factors Involved in Market Grades and Standards. A. Kramer, I. C. Haut, L. E. Scott, H. S. Todd, Eugenia Sokolov, A. A. Kornetsky, V. H. Nicholson, Ralph Kierstead and William Hudson.

- Q-58-h Development of Methods of Preparation of Canned and Frozen Tomato Concentrates. E. P. Walls and I. C. Haut.
- Q-58-i Improvement of Quality of Processed Tomatoes and Tomato Products. A. Kramer, F. C. Stark, H. S. Todd, A. A. El-Kattan, W. A. Ogle and Eugenia Sokolov.
- Q-58-j Suitability of Various Materials for Use as Containers for Frozen Vegetables. A. Kramer, Martha Lasky, Eugenia Sokolov and B. A. Twigg.
- Q-58-l The Effect of Corn Syrup Upon the Color of Tomato Ketchup. W. L. Ogle, Eugenia Sokolov and A. Kramer.
- Q-58-m Flavor Evaluations by Taste Test Panel Methods. A. Kramer, F. C. Stark, I. C. Haut, E. P. Walls, C. F. Evers, L. P. Ditman, C. E. Cox and D. H. Scott.
- Q-58-n Suitability of New Varieties of Horticultural Crops for Canning and Freezing. B. A. Twigg, W. A. Matthews, H. S. Todd, F. C. Stark and A. Kramer.
- Q-67-a The Influence of Organic Residues in the Production of Asparagus. F. C. Stark.
- Q-74 A Study of Regional Adaptation of Certain Vegetable Crops and Varieties in Maryland. F. C. Stark, A. A. Duncan, W. A. Matthews and L. E. Scott.
- Q-77 Crop Management Studies with Vegetable Crops. F. C. Stark, A. A. Duncan, L. E. Scott and W. A. Matthews.
- Q-79-b The Mineral Levels and Interrelationships of Mineral Nutrients in Fruit Plantings of Maryland. L. E. Scott, A. H. Thompson, C. O. Dunbar, John Popenoe, Virginia France and S. E. Maximos.
- Q-79-c Influence of Nutrient Intensity and Balance on the Quality and Physiological Defoliation of Cantaloupes. F. C. Stark, W. A. Matthews and S. H. Todd.
- Q-79-e Influence of Nutrient Intensity and Balance Upon the Yield and Quality of Tomatoes. F. C. Stark, A. Kramer, W. A. Matthews, L. E. Scott and S. H. Todd.
- Q-79-f Mineral Nutrition of the Sweet Potato with Special Reference to Cation Interrelationships. L. E. Scott, F. C. Stark and W. L. Ogle.
- Q-81 Cantaloupe Breeding and Selection with Particular Reference to Quality and Resistance to Defoliation. F. C. Stark.
- Q-82 Tomato Breeding and Selection with Particular Reference to Greater Resistance to Cracking and to Late Blight. F. C. Stark.

Poultry Husbandry

Project No.

- M-32-k Difference in Thyroid Activity as Related to Strain Differences in Growth, Feed Utilization and Feathering. C. S. Shaffner, W. E. Shaklee and H. L. Bumgardner.
- M-33-h Hormonal Control of Economic Traits in Poultry. C. S. Shaffner, A. Gabuten and M. H. Conner.
- M-33-i Development of a Flightless Strain of New Hampshire Chickens. C. S. Shaffner and M. A. Jull.
- M-33-j Semen Studies with Chickens and Turkeys. C. S. Shaffner, Phillip Bogdonoff and S. H. Qureshi.
- M-33-k Strain Comparisons for Broiler Production. C. S. Shaffner and M. A. Jull.
- M-34-e Medium Sized Strain of Turkeys with Certain Desirable Qualities. C. S. Shaffner and M. A. Jull.
- M-35-g The Requirement of the Growing Chick for Newer Members of the Vitamin B Complex. G. F. Combs, G. H. Arcsott, H. L. Jones and G. B. Sweet.
- M-35-i Amino Acids in Poultry Nutrition. G. F. Combs, P. F. Twining and G. H. Arcsott.
- M-35-k Unidentified Growth Factors for Chickens and Bacteria. Mary Shorb, G. F. Combs, F. A. Veltre, C. R. Brown, R. W. Bishop and G. L. Romoser.
- M-35-l Development of Improved Rations and Feeding Methods for Broiler Production. G. F. Combs, G. L. Romoser, C. K. Laurent and J. Nicholson.
- M-45 New Studies on the Causative Effects of Wheat in Pullet Disease. G. D. Quigley.

Sociology

Project No.

- S-2 Some Characteristics of the Family in Prince Georges County, Maryland: A Study in the Rural Urban Fringe. H. H. Hoffsommer, Wayne Rohrer, John Schmidt and Sherman Fitzgerald.

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SOCIOLOGY
W. C. Rohrer, M.S., Asst. Prof.

Changes In Personnel

APPOINTMENTS

G. A. Bourbeau, Ph.D., Associate Professor, Agronomy, September 22, 1952
R. L. Bruce, M.S., Assistant Professor, Editorial, July 1, 1952
A. M. Decker, Ph.D., Instructor, Agronomy, July 1, 1952
L. J. Enright, Ph.D., Assistant Professor, Horticulture, August 1, 1952
L. F. George, B.S., Instructor, Agricultural Engineering, November 15, 1952
E. C. Leffel, Ph.D., Assistant Professor, Animal Husbandry, September 16, 1952
J. M. Ryan, B.S., Associate Professor, Editorial, July 21, 1952

RESIGNATIONS

A. W. Burger, Ph.D., Assistant Professor, Agronomy, February 7, 1953
M. F. Ellmore, M.S., Instructor, Dairy Husbandry, November 30, 1952
A. A. El-Kattan, Ph.D., Research Associate, Horticulture, February 28, 1953
J. B. Outhouse, M.S., Associate Professor, Animal Husbandry, July 31, 1952
E. P. Walls, Ph.D., Professor, Horticulture, September 30, 1952

Financial Statement - July 1, 1952 to June 30, 1953

FEDERAL FUNDS

	Hatch	Adams	Purnell	Bankhead-Jones	Research Marketing			For Agr. Investigations*
					9b-1-9b-2	9b3	Title II	
Appropriation 1952-1953	\$15,000.00	\$15,000.00	\$60,000.00	\$36,488.62	\$46,382.51	\$19,750.00	\$2,043.97	
TOTALS	\$15,000.00	\$15,000.00	\$60,000.00	\$36,488.62	\$46,382.51	\$19,750.00	6,513.97	
Receipts from sources other than Federal 1952-53								
State Appropriations for Agricultural Investigations								\$415,155.56
Industrial Grants								113,995.93
Sales and Miscellaneous								140,848.43
								\$669,999.92
								98,386.46
								768,386.38
Balance brought forward July 1, 1952								
TOTAL								\$388,336.15
Expenditures:								14,675.32
Personal Services	\$ 6,500.00	\$11,933.30	\$19,282.34	\$25,391.60	\$33,747.67	\$ 9,697.57	\$4,642.16	
Travel	4,282.94		636.07	61.35	1,097.53	1,856.38	805.22	
Transportation		1.75	6.59	26.96	25.36	4.81		791.07
Communication Service			90.53	38.65	75.73	41.94		2,830.21
Rents and Utility Services			18.64	34.49	124.88	191.13		3,600.70
Printing and Reproduction			176.97		466.47	315.25	8.35	4,062.64
Other Contractual Services		28.80	1,062.79	571.21	310.17	763.07	943.03	28,034.89
Supplies and Materials	247.60	2,394.93	7,177.47	8,175.78	6,155.94	4,025.01		153,219.40
Equipment	2,880.85	626.22	1,548.60	1,099.14	3,792.61	2,851.84		58,652.97
Lands and Structures				1,089.24				2,603.52
Contributions to Retirement								
Balance June 30, 1953	\$15,000.00	\$14,985.00	\$60,000.00	\$36,488.62	\$45,794.36	\$19,750.00	\$6,400.76	\$656,806.87
		15.00			588.15		113.21	111,579.51
TOTALS	\$15,000.00	\$15,000.00	\$60,000.00	\$36,488.62	\$46,382.51	\$19,750.00	\$6,513.97	\$768,386.38

*Including Bankhead-Jones Offset Funds.

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